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Radiocarbon Dates pertinent to defining the last glacial maximum for the Laurentide and Innuitian ice sheets

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Geological Survey of Canada, Open File xxxx

Introduction

Radiocarbon dates are arranged below in two lists: A - those that provide maximum ages on the advance to the last glacial maximum, and B - those that provide minimum ages of recession from the last glacial maximum. In list B, an attempt is make to identify those dates that are considered to be anomalously old for regional deglaciation. These dates are on two main types of samples: samples with inadvertent blends of early postglacial and older materials and basal lake sediments with low organic contents or including material derived mainly from aquatic moss in hardwater lakes. Some of the dates currently accepted, because they have not been specifically challenged, are likely to be rejected in the future as AMS dating replaces conventional dating of bulk samples. Because of the many anomalously old ages from basal lake sediments, the Geological Survey of Canada Radiocarbon Laboratory established a policy of not accepting lake sediment samples with less than 5% by weight organic carbon content. Thus, organic content is used as one criterion for evaluating samples below, although measures of organic carbon content are often not available for dated samples in the literature.

In both lists, the order of presentation runs counterclockwise from the northwestern margin of the Laurentide Ice Sheet, through the southwestern, southern, southeastern, and northeastern Laurentide margins and finally to the Innuitian Ice Sheet area of the Canadian Arctic Archipelago. The radiocarbon age distributions are shown on histograms and maps in Dyke et al. (In press), Quaternary Science Reviews.

Marine shell dates are reported with a reservoir correction of -400 years where the reporting protocol is known; otherwise shell dates are listed as in sources. Where this causes the date to differ from the published form, the latter is noted if there seems a risk of confusion.

Only finite age determinations between 14 and 40 ka BP are considered here. Samples that yielded finite ages originally but were shown to be infinite on redating are omitted. No bulk organic carbon dates on marine sediments are included, because they are generally regarded as anomalously old due to incorporation of "old" organic carbon.

A. Maximum limiting dates on advance to LGM and on readvances until 14 ka

1. Northwestern Laurentide margin

27 790 ± 480 (GSC-667), marine shells, thought to have been ice transported, from crest of Winter Harbour Moraine, Melville Island, NT (74°47'N, 110°52'W; Lowdon and Blake, 1968; Hodgson et al., 1984); Winter Harbour Moraine has long been considered to mark the Late Wisconsinan Laurentide limit. However, it may mark the limit of a younger readvance (Hodgson and Vincent, 1984). Two named Laurentide tills occur beyond it.

33 800 ± 800 (GSC-1974), plant detritus, mainly willow with one piece of spruce, in coastal exposure in crossbedded sand, Cy Peck Inlet, NT (70°20'N, 127°57'W; Lowdon and Blake, 1978); about 20 km beyond probable LGM ice limit near Cape Bathurst. The sample was originally thought to be from sediment correlative with outwash issuing from the ice limit and to provide a maximum age on the ice limit, but later interpreted as deriving from lacustrine or marine sediment (Rampton, 1988). Presence of spruce suggests that the date may represent a blended age because spruce was probably not growing this far north during the Middle Wisconsinan.

21 620 ± 630 (Beta-6276), wood and herb fragments in mud below Tingmiark Sand, Uviluk borehole off Tuktoyaktuk Peninsula, NT (ca 70°15'N, 132°40'W; Hill et al., 1985; Héquette and Hill, 1989). This extensive offshore sand sheet is interpreted as Late Wisconsinan outwash.

37 400 ± 810 (CAMS-14837), moss fragments from Kittigazuit Formation eolian sand, Richards Island, Mackenzie Delta, NT (69°32'N, 134°00'W; Dallimore et al., 1997). Sand underlies till; *Corispermum* seeds from the same site dated 33 710 ± 460 (CAMS-14839).

39 800 ± 1200 (CAMS-66370), mammoth tooth from Richards Island, Mackenzie Delta, NT (Dyke, unpublished). On Richards Island, a thin surface till overlies thick Kittigazuit Formation eolian sands (Dallimore et al., 1997). This very well preserved tooth, supplied by Richard Binder of Innuvik, NT, is from a location not precisely known, but presumably from below the till. Another unpublished date on a mammoth tooth collected by Steve Wolfe, Geological Survey of Canada, from the beach at the north end of the island (69°34'N, 134°30'W) gave an age of 41 400 ± 1500 (CAMS-66371).

31 300 ± 640 (GSC-1191), plant detritus from fluvial silt and sand below clay of Glacial Lake Old Crow, YT (67°50'N, 139°34'W; Lowdon and Blake, 1979). The sample predates the maximum advance of Mackenzie Lobe of Laurentide ice. Other dates from same stratigraphic unit and section are 31 400 ± 660 (GSC-2739), plant detritus; 35 500 ± 1050 (GSC-2507), plant detritus (Schweger and Matthews, 1991). Willow wood from an ice-wedge pseudomorph below lake clay in a neighbouring section dated 38 800 ± 2000 (67°51'N, 139°50'W; GSC-2756).

34 220 ± 120 (TO-124), fecal pellets in organic silt below sand and glaciolacustrine clay in Bell basin of Glacial Lake Old Crow, YT (67°15'N, 137°04'W; Schweger and Matthews, 1991); maximum date for advance to LGM limit.

25 170 ± 630 (CRA-1232), mammoth tusk from alluvium 50 cm below contact with glaciolacustrine clay, Cadzow Bluff, Glacial Lake Old Crow, YT (67°34N, 138°54'W); maximum date on advance of Mackenzie Lobe to Buckland limit at MacDougal Pass (Morlan, 1986; Morlan et al., 1990). This sample also dated 24 700 ± 250 (RIDDL-229) using a more refined collagen extraction technique. Several other bones were dated from this alluvial unit. Dates on proboscidean bone or tusk are: 37 800 ± 800 (RIDDL-733) and 39 800 ± 1100 (RIDDL-731). Dates on bison bones are: 34 700 ± 600 (RIDDL-139), 35 200 ± 750 (RIDDL-309), 35 200 ± 750 (RIDDL-310), 36 500 ± 650 (RIDDL-144), 36 500 ± 1000 (RIDDL-138), 37 300 ± 750 (RIDDL-136), and 39 500 ± 900 (RIDDL-900). Dates on unidentified large mammals are 32 200 ± 500 (RIDDL-729), 34 100 ± 500 (RIDDL-728), and 35 700 ± 900 (RIDDL-137). Proboscidean bones found redeposited along the Old Crow River, but derived from the alluvial unit or from older units below Lake Old Crow, dated 25 200 ± 400 (RIDDL-191), 25 200 ± 300 (RIDDL-306), 25 450 ± 450 (RIDDL-193), 25 600 ± 300 (RIDDL-300), 25 620 ± 300 (RIDDL-303), 27 000 ± 400 (RIDDL-232), 27 100 ± 800 (RIDDL-192), 28 600 ± 350 (RIDDL-305), 28 780 ± 350 (RIDDL-301), 28 800 ± 450 (RIDDL-130), 30 100 ± 600 (RIDDL-125), 30 100 ± 600 (RIDDL-190), 30 680 ± 600 (RIDDL-231), 31 120 ± 450 (RIDDL-122), 31 300 ± 1400 (RIDDL-186), 31 200 ± 500 (RIDDL-727), 31 900 ± 650 (RIDDL-188), 32 000 ± 600 (RIDDL-132), 32 600 ± 600 (RIDDL-302), 33 400 ± 650 (RIDDL-304), 33 700 ± 800 (RIDDL-135), 34 200 ± 500 (RIDDL-726), 34 400 ± 850 (RIDDL-126), 34 600 ± 900 (RIDDL-185), 35 400 ± 900 (RIDDL-189), 35 800 ± 1000 (RIDDL-123), 36 500 ± 1000 (RIDDL-194), 36 600 ± 1000 (RIDDL-187), 37 200 ± 700 (RIDDL-725), 37 300 ± 1000 (RIDDL-131), 37 500 ± 1200 (RIDDL-129), 37 700 ± 1300 (RIDDL-124), 38 200 ± 1200 (RIDDL-307), 38 450 ± 1400 (RIDDL-195), 38 700 ± 900 (RIDDL-128), 39 500 ± 1600 (RIDDL-127), 39 700 ± 1000 (RIDDL-134), and 39 900 ± 1300 (RIDDL-233). Other redeposited bones dated 24 700 ± 300 (RIDDL-230, caribou), 35 500 ± 800 (RIDDL-143, large mammal), and 37 000 ± 950 (RIDDL-196). As pointed out by Thorson and Dixon (1983), this series of dates precludes the existence of Lake Old Crow during the interval 40-24 ka BP. The sudden disappearance of mammals from the basin at about 24 ka probably signifies formation of the large glacial lake and arrival of Laurentide ice at the LGM limit.

20 800 ± 200 (GSC-3946), plant detritus, mostly small woody stems, from basal silt thought to be either the lower part of a nearshore glaciolacustrine facies or the top of underlying alluvial channel sediment in the Bluefish basin of Glacial Lake Old Crow, YT (67°23.1'N, 140°21.7'W; Blake, 1987); maximum or actual date on advance to Buckland limit at MacDougal Pass.

26 570 + 680/-750 (DIC-1571), autochthonous peat layer in alluvial sediments along the Ramparts of the Porcupine River, AK (ca 67°05'N, 142°10'W; Thorson and Dixon, 1983). A period of fluvial aggradation (Valley-Fill Stage) preceded down-cutting of the Ramparts, which resulted from overflow of Glacial Lake Old Crow. Other dates in this sedimentary unit are 28 930 ± 425 (Beta-1827) on a delicately branched spruce log, 29 440 + 670/-740 (DIC-1570) on a mammoth tusk, and 30 590 + 730/-810 (DIC-1573) on fresh-appearing branched wood. The Valley-Fill Stage began shortly before 30.6 ka BP and ended well after 26 ka BP. Overflow from Lake Old Crow evidently did not occur during that interval.

36 900 ± 300 (GSC-2422), wood in alluvium under Buckland Drift, Hungry Creek, YT (65°35'N, 135°30'W; Hughes et al., 1981). The site is close to the LGM Laurentide limit.

27 170 ± 250 (TO-1192), wood redeposited in glaciofluvial sediments, near Big Smith Creek, upper Mackenzie valley, NT (ca 64°40'N, 124°40'W; Smith, 1992). Similar wood samples from nearby sites dated 27 260 ± 260 (TO-1188), 34 020 ± 1410 (AECV-918C), and 34 730 ± 3280 (AECV-919C), presumably limiting the timing of the last advance of the Mackenzie Lobe and indicating that most of the Mackenzie Valley was ice free during the Middle Wisconsinan.

2. Western and Southwestern Laurentide margin

27 400 ± 580 (GSC-2034), mammoth tooth from "interglacial" gravel, Taylor, BC (56°08.5'N, 120°40.5'W; Mathews, 1978; Bobrowski and Rutter, 1992); site lies in zone of overlap of Laurentide and Cordilleran tills. Bison bone from this site dated 22 870 ± 540 (I-10825; C.R. Harington, personal communication).

27 400 ± 850 (I-4878), wood from alluvium below glacial lake clay, Watino, AB (55°43'N, 117°38'W); youngest date from Middle Wisconsinan Watino Nonglacial Interval. Other wood dates from this site are 31 530 ± 1440 (AECV-416C), 34 900 +3000/-2000 (I-2626), 35 500 +2300/-1800 (I-2516), 35 500 +3300/-2300 (I-2615), 36 220 ± 2520 (AECV-415C), to >40 170 (AECV-414C; Liverman et al., 1989; Bobrowski and Rutter, 1992).

37 010 ± 2690 (AECV-428C), wood from alluvial gravel below till, Simonette, AB (55°05'N, 118°10'W; Liverman et al., 1989).

35 980 ± 1060 (GSC-728), wood fragments from alluvial sand below till, Taber, AB (49°55.5'N, 112°04'W; Lowdon and Blake, 1968).

24 490 ± 200 (GSC-205), wood fragments from fluvial Evilsmelling Band (sand, silt, peat) below till, Medicine Hat, AB (50°06'N, 110°38'W; Dyck et al., 1965; Stalker, 1976); other samples of plant detritus from same band dated at 25 000 ± 800 (GSC-1370) and 28 630 ± 800 (GSC-578).

37 900 ± 1100 (GSC-1442), wood fragments and bark from vertebrate bone bearing unit below till, Redcliff, AB (54°05'N, 110°49'W; Lowdon and Blake, 1975; Stalker, 1976); a second fraction of the sample dated 38 700 ± 1100 (GSC-1442-2).

27 730 ± 1060 (AECV-599C), caribou bone, Middle Wisconsinan gravel, Villeneuve, AB (53°41'N, 113°51'W; Young et al., 1994; Burns, 1996); same site, 39 960 ± 3950 (AECV-718C), mammoth bone, and 31 520 ± 450 (TO-1828), cervid antler. Wood (*Picea mariana*) from the same stratigraphic unit at a nearby site (53°37.5'N, 113°44.5'W) is dated 35 500 ± 2530 (AECV-1581C) and 35 760 ± 2130 (AECV-1582C).

22 020 ± 450 (AECV-719C), mammoth tusk, Middle Wisconsinan gravel, High Level, AB (58°31', 117°08'W; Burns, 1996).

27 860 ± 880 (AECV-721C), mammoth bone from Middle Wisconsinan gravel just east of Edmonton, AB (53°36.5'N, 113°20'W; Young et al., 1994; Burns, 1996). A second mammoth bone dated 28 890 ± 960 (AECV-612C) and a horse bone dated 29 380 ± 4970 (AECV-720C).

Bones from the same stratigraphic unit at a nearby site (53°35'N, 113°19.5'W) dated 21 330 ± 340 (AECV-1664C, horse); 22 820 ± 520 (AECV-538C, mammoth); 25 210 ± 760 (AECV-1201C, bison), and 31 220 ± 1260 (AECV-1202C, horse). Bones from the same stratigraphic unit at another site (53°38.5'N, 113°17'W) dated 26 750 ± 790 (AECV-1102C, mammoth); 27 520 ± 850 (AECV-937C, horse); 31 750 ± 1460 (AECV-936C, bison); 35 840 ± 2370 (AECV-938C, horse); 36 150 ± 2960, Proboscidea); 37 120 ± 2370 (AECV-934C, mammoth); and 38 960 ± 3520 (AECV-935C, mammoth). Wood from that site dated 37 500 ± 2650 (AECV-921C) and 37 800 ± 2060 (AECV-1465C). Bone from another site in the vicinity (53°36'N, 113°19.5'W) dated 31 290 ± 1960 (AECV-941C) and wood dated 36 900 ± 2030 (AECV-1478C).

22 750 ± 1650 (S-1964), mammoth bones, Middle Wisconsinan gravel, Edmonton, AB (53°42'N, 113°14'W; Burns, 1996); also 26 050 ± 880 (I-10650), mammoth bone (Harington, personal communication).

14 200 ± 1120 (GSC-1199), redeposited mammoth bone, Red Deer, AB (Lowdon and Blake, 1975; Burns, 1996); another sample from same unit dated 20 400 ± 320 (GSC-1387); therefore, probable that both samples are of Middle Wisconsinan age; not plotted on histogram.

22 200 ± 320 (RIDDL-681), prairie dog bones in gravel below till, Hand Hills, AB (51°34'N, 112°20'W; Young, 1991); other dates on prairie dog bones this site are 33 650 ± 340 (TO-871), 28 000 ± 250 (TO-872), 33 650 ± 340 (TO-1142), 29 610 ± 220 (TO-1304), 23 000 ± 150 (TO-1305), 25 980 ± 180 (TO-1307), and 17 060 ± 180 (TO-1143), last anomalously young (only 0.2% collagen yield; not plotted on histogram).

21 200 ± 1900 (AECV-632C, 654C), prairie dog bones in gravel below till, northeast of Drumhiller, AB (51°32'N, 112°14'W; Burns, 1996).

31 900 ± 1400 (QL-1738), bones of mixed species, January Cave, AB (50°11'N, 114°31'W; Burns, 1991); site thought to be on a Late Wisconsinan nunatak at 2040 m elevation in the general zone of coalescence of Laurentide and Cordilleran ice; bone assemblage represents nonglacial conditions; another sample dated 33 500 ± 1100 (QL-1737).

20 000 ± 850 (S-176), humus from paleosol below two tills, Leader, SK (50°59'N, 109°22'W; David, 1966); redated to >29 000 (GSC-2052; McNeely, 1989).

38 000 ± 560 (GSC-1041), wood in gyttja below till, Kenaston, SK (50°30'N, 106°18'W; Christiansen, 1971; Lowdon and Blake, 1970).

27 750 ± 1200 (S-96), wood in sand below two stratigraphic units containing glacial sediment, Outram, SK (49°10'30"N, 103°19'W; Christiansen, 1971; Dredge and Thorleifson, 1987; Clayton and Moran, 1982).

20 200 ± 500 (S-499), mammoth bone below till, Saskatoon, SK (52°10'N, 106°35'W; Lammers, 1968); several determinations on this sample produced unacceptable postglacial ages; therefore probable that S-499 is also somewhat too young; not plotted on histogram.

31 300 ± 1400 (S-3605), charred wood in paleosol under glacial sediment, Lancer Thrust Moraine, SK (50°46'28"N, 108°41'55"W; Morlan et al., 1997).

22 260 ± 1000 (GX-3530), wood and organic detritus from silt below two tills, Roseau River, MB (49°11'N, 96°39'W; Teller, 1980).

23 700 ± 290 (GSC-1279), charcoal from silt below till, Zelena, MB (51°24'N, 101°14'W; Klassen, 1979); a second date on charcoal is 37 700 ± 1500 (GSC-653); marl from this section dated 28 220 ± 380 (GSC-711).

33 860 ± 330 (TO-4639), mammoth tusk from gravel below till, Turtle Mountain, MB (49°06'N, 100°17'W; Fulton, 1995).

28 340 ± 1000 (W-2450), wood beneath fluvial sediment and two stratigraphic units containing glacial sediment, ND (ca. 48°N, 101.5°W; Clayton and Moran, 1982).

28 700 ± 800 (W-1045), peat and organic clay below till, Logan County, ND (46°26'N, 99°40'W; Ives et al., 1964).

26 150 + 3000/-2000 (GX-2864), wood below drift at depth of 27 m, SD (ca. 45°N, 97°W; Clayton and Moran, 1982).

20 670 + 1500/-1000 (GX-2741), wood under glacial sediment, Big Stone trench, SD (Clayton and Moran, 1982). [Note: this date is reported from two localities by this source.] Wood is from till according to Mickelson et al. (1983).

36 970 ± 950, wood from sand overlying Hewitt Till, below Late Wisconsinan till, Wadena Lobe, MN (Matsch and Schneider, 1988).

16 100 ± 1000 (I-1270), spruce wood from loess below till, Boone, IA (42°02'N, 93°57'W; Buckley et al., 1968).

20 000 ± 800 (O-1325), wood from glacial sediment (Tazewell Till), IA (ca 43°N, 95.5°W; Ruhe, 1969; Clayton and Moran, 1982).

25 390 ± 1380 (Beta-1764), wood in base of glacial sediment (Tazewell Till), IA (ca 43°N, 95.5°W; Clayton and Moran, 1982).

14 700 ± 400 (W-153), wood in loess below till, Bemis Moraine, IA (ca. 43.15°N, 93.383°W; Ruhe, 1969).

14 470 ± 400 (W-512), spruce stump in loess below glacial sediment, Bemis Moraine, IA (42°02'N, 94°28'W; Clayton and Moran, 1982).

14 200 ± 500 (I-1402), spruce wood in loess below glacial sediments, Bemis Moraine, IA (41°59'N, 93°27'W; Ruhe, 1969; 1983).

14 010 ± 75 (A-8120), wood in alluvium below till, Saylorville Spillway, Des Moines, IA (Lowell et al., 1999); other wood dates same locality are 14 038 ± 70 (A-8119), 14 065 ± 115 (A-7958), 14 190 ± 135 (A-7958.1, replicate of A-7958).

3. Southern Laurentide margin

3a. Superior Lobe

29 000 ± 1000 (W-747), wood in till, Hammond, WI (44°56'N, 92°30'W; Rubin and Alexander, 1960). Clayton and Moran (1982) indicate that the overlying till is older than Late Wisconsinan and that this sample may be anomalously young due to contamination.

26 060 ± 800 (W-2022), spruce wood below 60 m of proglacial fluvial sediment, Menominee, WI (44°54'N, 91°52'W; Black, 1976); located beyond LGM limit but requires ice south of Lake Superior.

3b. Michigan Lobe

31 800 ± 1200 (W-638), spruce wood in till, Lake Geneva, WI (42°33'N, 88°30'W; Rubin and Alexander, 1960).

30 800 ± 1000 (W-901), spruce log in gravelly sand below till, Waukesha, WI (43°03'N, 88°12'W; Rubin and Berthold, 1961).

29 000 ± 900 (W-903), spruce log in gravel below till, Elkhorn, WI (42°45'N, 88°33'W; Rubin and Berthold, 1961).

33 300 ± 1800 (I-5078), wood in gravel below drift near Grand Rapids, MI (ca 43°N, 85.75°W; Rieck and Winters, 1982).

25 050 ± ? (W-2897), wood from interstadial deposit northwest of Grand Rapids, MI (ca 43.25°N, 85.75°W; Rieck and Winters, 1982).

19 200 ± 700 (W-187), wood in base of till of Wedron Formation, Peoria, IL (ca 40°45'N, 89°35'W; Kempton and Gross, 1971); also 18 460 ± 500 (W-524).

26 700 ± 180 (GrN-1760), wood from peat below loess and till, Farmdale, IL (40°43'N, 89°38'W; Kempton and Gross, 1971; Vogel and Waterbolk, 1972). Moss in loess directly below till dated 20 340 ± 750 (W-349). Wood in Morton Loess below till dated 20 700 ± 650 (W-399).

25 600 ± 400 (I-849), organic deposits in Robein Silt beneath Tiskilwa Member till(?), northern IL (ca 42.4°N, 88.6°W; Kempton and Gross, 1971; Hansel and Johnson, 1992); maximum for advance to Marengo Moraine.

25 300 ± 1100 (I-1624), organic deposits in Robein Silt beneath Tiskilwa Member till(?), northern IL (ca 42.2°N, 88.4°W; Kempton and Gross, 1971; Hansel and Johnson, 1992);

maximum for advance to Marengo Moraine.

25 230 ± 570 (ISGS-127), organic silt beneath Tiskilwa Member till(?), Huntley, IL (42°07'30"N, 88°21'20"W; Hansel and Johnson, 1992); maximum for advance to Marengo Moraine.

24 370 ± 310 (ISGS-863), wood from clay at the Wedron section; interpreted as slackwater deposits caused by damming in front of the Marengo Moraine, formed by the Michigan Lobe, Wedron, IL (41°25'52"N, 88°46'50"W; Hansel and Johnson, 1992); believed to mark arrival of ice at the moraine. Wood from alluvial sand higher in section dated 24 900 ± 200 (ISGS-862).

21 460 ± 470 (ISGS-1486), wood from clay at the Wedron section; interpreted as slackwater deposits caused by damming in front of the Marengo Moraine, formed by the Michigan Lobe, NE IL (41°25'30"N, 88°47'00"W; Hansel and Johnson, 1992); believed to mark recession of ice from the moraine and to provide a maximum age for the subsequent advance to Bloomington Moraine during the Shelby Phase.

20 000 ± 200 (ISGS-26), silty peat below till of Shelbyville Moraine, Shelbyville, IL (39°24'36"N, 88°46'54"W; Kim, 1970).

19 500 ± 200 (ISGS-27), wood from sand and silt below till, Ashmore, IL (39°30'50"N, 88°06'56"W; Kim, 1970; Kempton and Gross, 1971).

21 300 ± 200 (ISGS-28), wood from organic silt below till, Ashmore, IL (39°31'N, 88°06'56"W; Kim, 1970; Kempton and Gross, 1971).

19 680 ± 460 (ISGS-532), wood in loess below till behind Shelbyville Moraine, IL (40°40'15"N, 89°28'53"W; Hansel and Johnson, 1992).

26 680 ± 380 (ISGS-533), top of organic silt with wood below till, Farmdale Park, IL (40°40'43"N, 89°29'18"W; Liu and Coleman, 1981). Base of silt dated 27 700 ± 770 (ISGS-535). Dates from same unit nearby are 22 900 ± 900 (W-68) and 25 100 ± 800 (W-69).

20 670 ± 280 (ISGS-828), moss from a 1-2 cm thick moss bed in loess below Wedron till, Clinton, IL (40°10'09"N, 88°50'20"W; Liu et al., 1986).

18 460 ± 500 (W-524), wood from base of till, Farmdale, IL (40°40'N, 89°30'W; Rubin and Alexander, 1960).

21 670 ± 130 (ISGS-79), wood in silt below till, Mahomet, IL (40°09'21"N, 88°26'20"W; Coleman, 1973); also dated 19 320 ± 1000 (WAT-117; Berry and Drimmie, 1982).

20 800 ± 130 (ISGS-81), wood in till, Danville, IL (40°08'42"N, 87°43'38"W; Coleman, 1973); wood in silt below till dated 20 500 ± 210 (ISGS-83).

21 420 ± 720 (ISGS-85), wood from silt below till, Fairmont, IL (40°00'10"N, 87°51'45"W; Coleman, 1973).

20 500 ± 130 (ISGS-89), wood from silt below drift, Coles County, IL (39°23'45"N, 88°04'50"W; Coleman, 1973).

3c. Huron Lobe

24 000 ± 4000 (M-2145), mammoth tooth redeposited in Holocene alluvium near Coleman, MI (43°40'35"N, 84°20'45"W; Kapp, 1970); interpreted as evidence of ice-free conditions during the Plum Point Interstade. The tooth is well preserved and little abraded.

25 480 ± 700 (W-3667), wood(?) below till near Croswell, MI (ca 43.3°N, 82.75°W; Reick and Winters, 1982).

3d. Erie Lobe

23 300 ± 600 (W-663), wood in interstadial peat and clay below till, East White Sublobe, Mansfield, IN (39°43'N, 87°06'W; Mickelson et al., 1983).

21 400 ± 860 (PIC-32), organic silt below till, East White Sublobe, Crawfordsville, IN (Gooding, 1975; Mickelson et al., 1983).

21 340 ± 1860 (PIC-18), wood in alluvial sand and silt below till, East White Sublobe, Montgomery County, IN (Gooding, 1975; Mickelson et al., 1983).

21 610 ± 310 (ISGS-455), spruce wood in till, Logansport, IN (40°47'35"N, 86°27'00"W; Liu and Coleman, 1981).

20 110 ± 360 (ISGS-475), wood in till of Shelbyville Moraine, East White Sublobe, Russellville, IN (39°51'37"N, 86°58'30"W; Mickelson et al., 1983). Wood in silt below the till dated 21 010 ± 350 (ISGS-477) and organic debris in silt below till dated 21 100 ± 200 (ISGS-378). At nearby Russellville Quarry, wood from subtill organic silt dated 22 360 ± 580 (ISGS-1071) and glacially transported organic silt dated 22 400 ± 210 (ISGS-1075; Liu et al., 1986).

21 310 ± 350 (ISGS-382), plant debris in silty sand below till of Trafalgar Formation, Fort Wayne, IN (41°01'30"N, 87°12'00"W; Liu and Coleman, 1981).

22 950 ± 160 (ISGS-677), wood from till, Cutler, IN (40°29'02"N, 86°30'12"W; Liu et al., 1986).

20 080 ± 100 (ISGS-690), woody debris from top of silt below till, Green Castle, IN (39°37'47"N, 86°53'00"W; Liu et al., 1986).

21 660 ± 240 (ISGS-1067), wood from sheared sand-clay layer below till, Lafayette, IN (40°25'56"N, 86°49'20"W; Liu et al., 1986).

20 500 ± 800 (W-577), wood in interstadial deposits below till, East White Sublobe, IN (39°45'N, 87°11'W; Mickelson et al., 1983).

19 500 ± 800 (W-165), wood in interstadial deposits below till, East White Sublobe, IN (Mickelson et al., 1983).

20 230 ± 200 (Y-1248), spruce wood in interstadial deposits below till, East White Sublobe, Johnson County, IN (40°23'N, 87°05'10"W; Gooding, 1975; Mickelson et al., 1983); same sample or site as OWU-8 (19 906 ± 691), DAL-10A (21 400 ± 700), DAL-10B (21 700 ± 1200), DAL-42 (18 899 ± 270), DAL-119 (18 911 ± 407), SI-4? (17 145 ± 210), SI-4? (16 555 ± 250).

20 900 ± 500 (I-5216), wood in gravel below till, East White Sublobe, New Castle, IN (Gooding, 1975; Mickelson et al., 1983).

20 800 ± 800 (W-579), wood in interstadial deposits below till, East White Sublobe, Marion County, IN (39°53'N, 86°15'W; Mickelson et al., 1983).

20 660 ± 180 (ISGS-541), conifer wood in till, East White Sublobe, Fillmore, IN (39°42'30"N, 85°45'W; Mickelson et al., 1983).

20 300 ± 800 (W-597), wood in interstadial silt below till, East White Sublobe, Trafalgar, IN (39°25'N, 86°08'W; Mickelson et al., 1983); other wood dates this site are 20 100 ± 900 (W-598), 20 900 ± 800 (W-580).

19 930 ± 990 (PIC-17), wood in silt below till, East White Sublobe, Hendricks County, IN (Gooding, 1975; Mickelson et al., 1983).

22 300 ± 800 (W-595), wood in till of Shelbyville Moraine, East White Sublobe, Clayton, IN (39°42'N, 86°30'W; Mickelson et al., 1983).

21 400 ± 650 (W-668), conifer wood in till of Shelbyville Moraine, East White Sublobe, Vigo County, IN (39°29'N, 87°30'W; Mickelson et al., 1983).

24 070 ± 570 (I-9637), peaty silt in basal till, Cates Strip Pit, IN (39°59'43"N, 87°21'48"W; Buckley and Valdes-Pages, 1981).

20 100 ± 400 (I-9634), organic silt of Trafalgar Formation below till, Putnam County, IN (39°41'16"N, 86°45'15"W; Buckley and Valdes-Pages, 1981).

22 340 ± 520 (I-10175), wood in outwash below till, Fort Wayne, IN (41°01'36"N, 85°11'58"W; Buckley and Valdes-Pages, 1981).

21 830 ± 510 (I-10073), organic silt below till behind Crawfordsville Moraine, Russellville, IN (39°50'44"N, 86°59'14"W; Buckley and Valdes-Pages, 1981); wood debris below till dated 20 100 ± 400 (I-10074).

23 400 ± 600 (W-1688), humus from weak paleosol (weathered and leached organic silt) in sand and silt below till, Miami Sublobe, Little Four Mile Creek, College Corner, IN (39°36'35"N, 84°49'45"W; Gooding, 1975; Mickelson et al., 1983).

19 670 ± 68 (average of 5 age determinations: Pitt-227, -506, -507, -508, -509), tree stumps below till at the LGM limit of the Miami Sublobe, Sharonville, OH (ca 39.4°N, 84.5°W; Lowell and Stuckenrath, 1990; Lowell et al., 1990); ages range from 19 200 ± 140 (Pitt-508) to 20 200 ± 140 (Pitt-507); plotted as one sample on histogram; trees probably killed by glacier over ridding. An organic layer at the top or organic silt in which the stumps are rooted ranges from 21 120 ± 130 (Pitt-225 on moss and organic mat) to 21 945 ± 180 (Pitt-224 on a larch root). Wood incorporated in the overlying till has been dated 19 610 ± 120 (Pitt-352), 21 450 ± 170 (Pitt-353), 21 480 ± 145 (Pitt-354), and 22 550 ± 275 (Pitt-228).

20 210 ± 145 (Pitt-232), wood in till just behind LGM limit of the Miami Sublobe at Princeton, OH (ca 39.45°N, 84.55°W; Lowell and Stuckenrath, 1990); a second age determination on wood from this till of 15 740 ± 80 (Pitt-231) is rejected by these authors; a peat inclusion in the till dated 19 500 ± 115 (Pitt-229); organic layer below the till dated 36 650 ± 980 (Pitt-230). Other dates on wood in till from this site are 19 390 ± 180 (ISGS-2614), 19 480 ± 190 (ISGS-2616), 19 600 ± 180 (ISGS-2617), and 19 690 ± 180 (ISGS-2615).

20 030 ± 140 (Pitt-625), stump below till behind LGM limit, Oxford, OH (ca 39°30'N, 84°45'W; Lowell et al., 1999); second determination of 20 620 ± 180 (Pitt-624). A second stump was dated twice, yielding 21 240 ± 150 (Pitt-765) and 21 390 ± 200 (Pitt-764; Ekberg et al., 1993). Wood fragments from silt in which the stumps are rooted dated 20 430 ± 160 (Beta-12580) and 19 880 ± 130 (TO-2069). A stump slightly transported below till dated twice at 20 820 ± 210 (ISGS-2757) and 20 850 ± 200 (ISGS-2762).

25 100 ± 1600 (DAL-5), wood in till of Hartwell Moraine, Miami Sublobe, Oxford, OH (ca 39°30'N, 84°45'W; Mickelson et al., 1983); same sample or site as OWU-490 (19 535 ± 655); other wood samples from same stratigraphic position were dated 19 770 ± 110 (Pitt-623), 19 800 ± 175 (Pitt-627); 19 980 ± 500 (W-92, spruce), and 19 970 ± 140 (Pitt-626). Wood, probably ice transported, from supraglacially deposited sediment ("meltout till") at this site gave the following sequence of dates: 20 840 ± 110 (Pitt-769), 21 550 ± 150 (Pitt-768), 21 500 ± 170 (Pitt-767), and 21 680 ± 170 (Pitt-766).

18 120 ± 180 (UGa-6704), log with bark below till behind Owl Creek Moraine Complex, Bier's Run, OH (Lowell et al., 1999). Other sub-till dates this site are 18 340 ± 290 (UGa-6703), log with branches; 18 520 ± 245 (UGa- 6702), log with branches; 18 520 ± 200 (UGa-6705), log; 17 590 ± 210 (UGa-6709), log; 18 240 ± 180 (UGa-6711), silt; 18 490 ± 280 (UGa-6710), silt. Dates on wood in till are 18 520 ± 280 (UGa-6708), 18 750 ± 260 (UGa-6706), 18 800 ± 290 (Uga-6707), 17 490 ± 230 (UGa-6698),

19 620 ± 150 (ISGS-2646), wood in till behind Hartwell Moraine, Beckett Road, OH (Lowell et al., 1999). Other wood samples in till dated 19 670 ± 230 (ISGS-2652), 19 780 ± 170 (ISGS-2642), 19 800 ± 160 (ISGS-2645), 19 830 ± 190 (ISGS-2643).

19 410 ± 140 (ISGS-2621), wood at basal contact of till behind Hartwell Moraine, Dimmick Road, OH (Lowell et al., 1999). Other wood samples same position dated 19 450 ± 190 (ISGS-2620), 19 500 ± 270 (ISGS-2624), 19 520 ± 180 (ISGS-2619), 19 640 ± 200 (ISGS-2625), 19 730 ± 140 (ISGS-2618).

20 110 ± 170 (ISGS-2834), organic mat at top of alluvium below till behind Hartwell Moraine, Creek Road, OH (Lowell et al., 1999). Another sample of this material dated 20 290 ± 160 (ISGS-2828). Organic mat at base of alluvium above a buried till dated 22 730 ± 460 (ISGS-2837) and 22 800 ± 330 (ISGS-2829).

24 790 ± 780 (OWU-140B), spruce wood in outwash gravel below till of Hartwell Moraine, Miami Sublobe, Ross Well, OH (39°18'N, 84°42'W; Mickelson et al., 1983).

20 000 ± 500 (I-610), wood in organic rich silt below till, Miami Sublobe, Ross Well, OH (39°35'N, 85°07'32"W; Mickelson et al., 1983).

21 150 ± 450 (I-4345), wood in Fayette till of Hartwell Moraine, Miami Sublobe, Ross Well, Sefton, OH (Gooding, 1975; Mickelson et al., 1983).

24 440 +560/-590 (DIC-47), wood in interstadial deposit below till, Miami Sublobe, Doty's Highbank, OH (Mickelson et al., 1983).

23 300 ± 500 (I-7345), humus layer (leached organic silt) in paleosol below till, Miami Sublobe, New Paris, OH (ca 40°N, 84.4°W; Gooding, 1975; Mickelson et al., 1983).

23 000 ± 800 (W-188), wood on Sidney Soil below till, Miami Sublobe, Sidney, OH (Goldthwait, 1958; Gooding, 1975; Mickelson et al., 1983); redated 22 480 ± 800 (W-356).

22 800 ± 200 (GrN-4512), peat in interstadial deposit below till, Miami Sublobe, Upper Bush Creek, OH (40°52'N, 82°40'W; Mickelson et al., 1983); same sample or site 22 430 ± 140 (GrN-1761), 22 400 ± 260 (GrN-4513).

27 650 ± 1000 (I-6183), wood in till (Fayette) of Hartwell Moraine, Miami Sublobe, Camden, OH (Gooding, 1975; Mickelson et al., 1983).

22 230 + 415/-430 (DIC-47?), wood in till of Hartwell Moraine, Miami Sublobe, OH (Mickelson et al., 1983).

21 940 ± 130 (ISGS-116), wood in Fayette till of Hartwell Moraine, Miami Sublobe, Eaton, OH (39°44'45"N, 84°30'30"W; Gooding, 1975; Mickelson et al., 1983); same sample or site as DIC-47.

22 000 ± 1000 (W-414), spruce wood in till of Hartwell Moraine, Miami Sublobe, Brush Creek, near Kirkwood, OH (Goldthwait, 1958; Burns, 1958; Mickelson et al., 1983).

21 600 ± 400 (W-648), wood in till of Hartwell Moraine, Miami Sublobe, Fairborn, OH (39°47'N, 84°03'W; Mickelson et al., 1983).

21 340 ± 125 (GrN-4514), wood in basal till (Fayette) below forest bed which underlies Shelbyville till of Hartwell Moraine, Miami Sublobe, Oxford, OH (39°30'N, 84°45'W; Gooding, 1975; Mickelson et al., 1983).

20 700 ± 600 (W-37), spruce wood in till of Hartwell Moraine, Miami Sublobe, Southern Hills, OH (39°39'N, 84°11'W; Goldthwait, 1958; Burns, 1958; Mickelson et al., 1983); redated 20 000 ± 500 (L-397C).

20 290 ± 800 (I-1007), wood in Fayette till of Hartwell Moraine, Miami Sublobe, Little Cedar Creek, OH (Gooding, 1975; Mickelson et al., 1983). Wood in till at same or nearby site dated 19 900 ± 500 (I-1778).

20 500 ± 800 (W-304), spruce wood in till of Hartwell Moraine, Miami Sublobe, Westchester, OH (Goldthwait, 1958; Burns, 1958; Mickelson et al., 1983).

20 275 ± 620 (OWU-102bis), spruce wood in till of Hartwell Moraine, Miami Sublobe, Turtle Creek, OH (Mickelson et al., 1983); same sample or site as OWU-102 (19 620 ± 372).

19 800 ± 500 (I-1776), wood in till of Hartwell Moraine, Miami Sublobe, Big Cedar Creek, OH (Gooding, 1975; Mickelson et al., 1983).

19 800 ± 300 (L-467), wood in till of Hartwell Moraine, Miami Sublobe, OH (Mickelson et al., 1983).

19 620 ± 470 (I-6182), wood in till of Hartwell Moraine, Miami Sublobe, Muttonville, OH (Gooding, 1975; Mickelson et al., 1983; Ekberg et al., 1993).

18 400 ± 300 (OWU-286), spruce wood in till, Miami Sublobe, Brown's Creek, Madison Township, OH (Mickelson et al., 1983).

20 000 ± 500 (I-610), wood from Connersville Interstadial silt below till, Miami Sublobe, Sefton, OH (Gooding, 1975; Mickelson et al., 1983).

18 750 ± 300 (W-738), wood from organic silt below till, Miami Sublobe, Hamilton, OH (39°25'N, 84°33'W; Gooding, 1975; Mickelson et al., 1983); also 19 100 ± 300 (W-724), wood.

21 500 ± 60 (QL-1372), organic rich silt below till, Doty's Highbank, behind Hartwell Moraine, OH (39°33'05"N, 85°43'55"W; Ekberg et al., 1993).

21 350 ± 60 (QL-1373), unspecified material in deformation till behind Hartwell Moraine, Doty's Highbank, OH (39°33'05"N, 85°43'55"W; Ekberg et al., 1993); a second determination from same context is 21 070 ± 100 (ISGS-604); wood in overlying ablation till dated 20 520 ± 120 (Pitt-935), 20 100 ± 800 (L-653C). A log from "stump zone" below till dated twice at 20 820 ± 140 (Pitt-936) and 22 240 ± 190 (Pitt-937). Other samples from the same horizon dated 20 210 ± 260 (ISGS-761, red spruce) and 24 440 ± 535 (DIC-47); the organic-bearing bed is considered to be an ice transported block.

18 610 ± 100 (Pitt-930), stump below till behind Hartwell Moraine, Milford Cemetery, OH (Ekberg et al., 1993); same stump dated 19 030 ± 110 (Pitt-937); these two dates regarded as anomalously young by Ekberg et al.

18 780 ± 130 (Pitt-933), log below till behind Hartwell Moraine, Reily, OH (Ekberg et al., 1993); same log dated 20 290 ± 120 (Pitt-934) and 20 140 +200/-280 (A-6444); a fourth sample from the same context dated 23 090 ± 210 (Pitt-932).

19 350 ± 130 (ISGS-764), red spruce wood from Shelbyville till and underlying interstadial deposit, Gregory Creek, OH (39°24'30"N, 84°25'20"W; Liu et al., 1986).

23 000 ± 850 (Y-449), *Abies* log in till of Scioto Sublobe, Columbus, OH (39°57.5'N, 83°00'W; Mickelson et al., 1983).

21 600 ± 1000 (W-127), wood in till of Scioto Sublobe, Harrisburg, OH (Goldthwait, 1958; Mickelson et al., 1983).

21 080 ± 200 (ISGS-42), wood in till of Scioto Sublobe, Hillsboro, OH (39°14'56"N, 83°34'52"W; Mickelson et al., 1983). Wood in till nearby (39°15'44"N, 83°32'52"W) dated 20 910 ± 240 (ISGS-44).

21 400 ± 600 (W-88), wood in till of Scioto Sublobe, Newark, OH (ca 40°05'N; 82°25'W; Goldthwait, 1958; Mickelson et al., 1983).

20 700 ± 1000 (DAL-14), charcoal from silt below till north of Reesville Moraine of Scioto Sublobe, Fayette County, OH (39°36'18"N, 83°38'03"W; Mickelson et al., 1983); redated 17 340 ± 390 (OWU-256) and 19 303 ± 1080 (OWU-488).

19 500 ± 500 (DAL-77), wood from silt below till of Scioto Sublobe, Columbus, OH (39°53'30"N, 83°02'10"W; Mickelson et al., 1983); same sample or site as OWU-452 (19 850 ± 765).

19 735 ± 475 (OWU-257), plant fragments from silt below till of Scioto Sublobe, OH (39°38'42"N, 83°33'02"W; Mickelson et al., 1983).

18 050 ± 400 (W-91), spruce wood in till of Cuba Moraine, Scioto Sublobe, Biers Run, near Chillicothe, OH (ca. 39°20'N, 83°W; Goldthwait, 1958; Burns, 1958; Mickelson et al., 1983); redated 17 880 ± 224 (OWU-52).

18 500 ± 420 (Y-448), spruce wood in till of Cuba Moraine, Scioto Sublobe, Cuba, OH (39°21'N, 83°51'W; Burns, 1958; Gooding, 1975; Mickelson et al., 1983).

18 000 ± 400 (W-331), spruce wood in till of Cuba Moraine, Scioto Sublobe, Anderson Run, near Anderson, OH (ca 39°30'N, 83°W; Goldthwait, 1958; Burns, 1958; Mickelson et al., 1983).

17 290 ± 436 (OWU-76), spruce wood in till of Cuba Moraine, Scioto Sublobe, Adelphi, OH (Mickelson et al., 1983).

20 820 ± 600 (W-2465), wood in till of Scioto Sublobe, OH (Mickelson et al., 1983).

20 400 ± 700 (W-2459), wood in till of Scioto Sublobe, OH (Mickelson et al., 1983).

19 800 ± 400 (I-4795), wood in till of Scioto Sublobe, OH (Mickelson et al., 1983).

20 240 ± (ISGS-3233), spruce roots and stump below glaciofluvial sediments behind Cuba Moraine, Cuba Gully, OH (Lowell et al., 1999). Other samples dated 20 420 ± 120 (ISGS-3232) and 20 550 ± 280 (ISGS-3234).

23 160 ± 180 (ISGS-2935), wood in organic silt below till behind Cuba Moraine, Todd Fork, OH (39°25'N, 83°55'W; Lowell et al., 1999). Another sample dated 23 250 ± 210 (ISGS-2936). Stumps in organic silt below till dated 23 150 ± 180 (ISGS-2939), 23 110 ± 240 (ISGS-2940), 23 230 ± 400 (ISGS-3067), 23 150 ± 240 (ISGS-3068), and 23 540 ± 300 (ISGS-3066).

28 195 ± 535 (K-361-3), wood in paleosol in loess deformed by ice thrust during earliest Late Wisconsinan advance of Erie Lobe, south of Cleveland, OH (ca. 41°30'N; 81°42'W; Fullerton, 1986); see GrN-2625 below.

24 600 ± 800 (W-71), log in varved clay and silt below Kent Till of Erie Lobe, near Cleveland, OH (41°21'N, 81°35'W; Goldthwait, 1958; Gooding, 1975; Fullerton, 1986); other wood dates this locality: 24 520 + 695/-760 (DIC-38), 23 313 ± 391 (K-361-4), 23 560 + 610/-645 (DIC-35), 23 430 + 410/-420 (DIC-63), and 22 210 + 120/-130 (DIC-32).

14 780 ± 192 (OWU-83), spruce wood in till north of the Powell Moraine, Liberty, OH (40.25°N, 83.25°W; Dreimanis and Goldthwait, 1973).

27 650 + 3000/-2100 (GX-8928), organic silt beneath Kent till, Grand River Sublobe, western NY (ca. 42°N, 79.5°W; Fullerton, 1986).

37 840 ± 3255 (St-3438), peat ball from a bed of gravel and sand containing lumps of till, peat, gyttja and clay below Port Stanley Till; type section of the Erie Interstade, Port Talbot, ON (Morner and Dreimanis, 1973); interpreted as a lump of Port Talbot Interstadial peat redeposited in an Erie Interstadial glacial lake; other than this date, the Erie Interstade is undated; from the sediment descriptions at the type section, it appears possible that the deposits could be subglacial.

27 470 ± 130 (GrN-2625), wood from base of Catfish Creek Till at Tyrconnell, near Plum Point, ON. (42°36'N, 81°24'W; Dreimanis et al., 1966, CJES 3, p. 305); other wood dates from base of this till are: 28 200 ± 1500 (L-185-B), 27 600 + 3000 -2500 (Gulf Research, unnumbered), and 27 500 ± 1200 (W-177), as well as GSC-2126, below; according to Fullerton (1986), this advance culminated 27.5 ka at the Allegheny Plateau margin south of Cleveland. Wood from Catfish Creek Till dated 24 600 ± 1600 (L-217-B) may relate to a later recession and readvance.

28 000 ± 370 (GSC-2126), wood from waterlaid Catfish Creek Drift derived from Plum Point Interstadial deposit, Plum Point, ON (42°36.5'N, 81°23.67'W; Lowdon et al., 1977); wood from the same unit and stratigraphically higher dated 27 470 ± 130 (GrN-2625); wood from Plum Point interstadial sediments also dated 28 200 ± 1500 (L-185).

3d. Ontario Lobe

25 450 + 6600/-3600 (QC-238), wood fragments in till north of the Almond Till limit in southwest-central NY (ca 42°N, 78°W; Fullerton, 1986).

22 800 ± 450 (GSC-816), wood in sandy clay interstadial sediments below drift, St. Davids Gorge, ON (43°07.67'N, 79°05'W; Hobson and Terasmae, 1969).

28 300 ± 600 (GSC-1082), plant debris from varved lacustrine sediment below Leaside Till, Thorncliffe Formation, Toronto, ON (43°41'07"N, 79°13'38"W; Morner, 1971; Berti, 1975).

32 000 ± 690 (GSC-1221), plant debris from sandy varves below GSC-1082, Thorncliffe Formation, Toronto, ON (43°43'02"N, 79°13'49"W; Morner, 1971; Berti, 1975).

4. Southeastern Laurentide margin

38 800 + 5600/-3200 (RL-318), peat below Late Wisconsinan till, Montauk Point, Long Island, NY (ca 41°05'N, 71°55'W; Stone and Borns, 1988).

21 750 ± 750 (SI-1590), organic silt, youngest of 26 finite dates on organic beds (ranging up to 40 800 ± 1400; SI-1595 on peat) from ice thrust deposits, Port Washington, western Long Island, NY (40°49'N, 73°42'W; Fullerton, 1988; Sirkin and Stuckenrath, 1980); located just behind the Late Wisconsinan terminal moraine; materials dated between 21.7 and 27.9 ka and older than 32 ka have spruce dominated pollen assemblages, whereas more thermophilous tree pollen appears 28-32 ka. An additional date on fine organics from clastic sediment is 28 200 ± 850 (SI-1608). Dates are on peat are 22 680 ± 440 (SI-1603), 26 300 ± 350 (SI-1605), 27 800 ± 800 (SI-1591), 28 450 ± 600 (SI-1589), 33 350 ± 1050 (SI-1596), 34 800 ± 800 (SI-1593), 36 600 ± 1075 (SI-1592). Dates on wood (probably coniferous) are 31 550 ± 950 (SI-1511), 35 300 ± 1500 (SI-1539A), 36 500 ± 1030 (SI-1539B), 37 700 ± 1400 (SI-1539), 39 350 ± 600 (SI-1601). Dates on oyster shells are 25 000 ± 450 (SI-1606), 27 950 ± 450 (SI-1536), 29 600 ± 3570 (SI-1604), 29 950 ± 600 (SI-1538), 32 050 ± 830 (SI-1609), 32 850 ± 850 (SI-1607), 33 400 ± 900 (SI-1537), 36 400 ± 2850 (SI-1602), 36 650 ± 1150 (SI-1600).

26 900 ± 700 (I-), marine shells from Cape Cod, MA (ca 41°50'N, 70°20'W; Stone and Borns, 1988); wood this locality dated 20 700 ± 2000 (I-).

29 100 ± 600 (W-4633), marine shells from Nantucket, MA (ca 41°15'N, 70°05'W; Stone and Borns, 1988); wood this locality dated 27 900 ± 400 (W-4197).

29 200 ± 500 (SI-4519), wood from late-glacial lake sediment, Upper South Branch Pond, ME (46°05'N, 68°54'W; Anderson et al., 1988); redeposited probably after some glacial transport. Note that the basal postglacial sediment date from this pond is anomalously old for regional deglaciation, which also suggests inclusion of older organic material.

30 000 ± 1200 (UQ-1200), marine shells in till, Anticosti Island, QC (49°23.78'N, 63°31.28'W; Gratton et al., 1984).

29 060 ± 1050 (UQ-510), marine shells in till, Anticosti Island, QC (49°24.13'N, 63°30.83'W; Gratton et al., 1984).

28 100 ± 200 (UQ-509), marine shells in glaciomarine sediment, Anticosti Island, QC (Gratton et al., 1984); site though to have remained beyond LGM ice limit because sediments neither disturbed nor overlain by till.

37 200 ± 1310 (GSC-2469), wood from mastodon dung ball, Hillsborough, NB (45°54.6'N, 64°39.8'W; Blake, 1983).

31 300 ± 500 (GSC-1220-2), mastodon bone from postglacial alluvium, Middle River, NS (46°08.1'N, 60°55.2'W; Blake, 1984).

21 920 ± 150 (TO-246), marine shell in till, Bay St. Lawrence, NS (Grant, 1994 cited in Stea et al., 1998).

24 300 ± 110 (no lab no. cited), date on unspecified material indicating ice-free areas in northern ME (Dorion, 1997); also 24 500 ± 130 (no lab no. cited) date on unspecified material indicating ice-free conditions at Jo Mary Pond in central ME.

27 590 ± 220 (TO-2038), redeposited marine shell off Lunenburg, NS (44°15'N, 64°10'W; Piper and Fehr, 1991); maximum for last ice advance onto inner Scotian Shelf; published age 27 990 ± 220 not reservoir corrected.

33 970 ± 560 (TO-376), marine shell in channel gravel, core G046, Sable Island Bank, NS (43°51'N, 60°38'W; Amos and Miller, 1990); presumed to be redeposited in glacial sediment (King, 1996); other dates on shells from channel gravel in this core are 24 800 ± 260 (TO-374), 27 540 ± 270 (TO-375), and 39 600 ± 970 (TO-373); not clear if these dates are reservoir corrected.

32 130 ± 270 (TO-753), marine shell in channel gravel, core G057, Sable Island Bank, NS (43°51'N, 60°38'W; Amos and Miller, 1990); presumed to be redeposited in glacial sediment (King, 1996); other dates on shells from channel gravel in this core are 32 270 ± 280 (TO-754) and 32 200 ± 290 (TO-755) not clear if these dates are reservoir corrected.

33 990 ± 390 (TO-756), marine shell in channel gravel, core G058, Sable Island Bank, NS (43°45'N, 60°45'W; Amos and Miller, 1990); presumed to be redeposited in glacial sediment (King, 1996); other dates on shells from channel gravel in this core are 34 360 ± 290 (TO-757), 34 360 ± 290 (TO-758), and 37 890 ± 370 (TO-759); not clear if these dates are reservoir corrected.

30 010 ± 350 (RIDDL-640), marine shell in "seismic unit 2", core Thebaud I-93, Scotian Shelf, NS (McLaren, 1988); not clear if these dates are reservoir corrected.

37 210 ± 400 (RIDDL-639), marine shell in "seismic unit 2", core SAB-85, Sable Island Bank, NS (Boyd et al., 1988); not clear if these dates are reservoir corrected.

20 380 ± 170 (TO-2088), marine shell below "till tongue", core 90-015-1, Scotian Shelf, NS (Baltzer et al., 1994); thought to date arrival of ice at LGM limit. Reported as TO-2077 by King (1996); published age 20 780 ± 170 not reservoir corrected.

20 510 ± 160 (TO-3323), foraminifera in turbidite, core 91-020-13, Scotian Shelf, NS (Berry and Piper, 1993); thought to date arrival of ice at LGM limit; published age 20 910 ± 160 not reservoir corrected.

25 800 ± 1000 (Beta-8984), shell fragment redeposited in Emerald Silt, thought to be glacially transported or otherwise reworked, borehole 4, Banquereau, Scotian Shelf, NS (44°25'N, 58°22'W; Amos and Knoll, 1987) published age 26 200 ± 1000 not reservoir corrected; similar samples this core gave reservoir corrected ages of 19 080 ± 250 (Beta-8992), 24 700 ± 400 (Beta-8985), 26 270 ± 450 (Beta-8986), 24 260 ± 300 (Beta-8990), 17 620 ± 430 (Beta-8983); published ages not reservoir corrected.

24 010 ± 480 (Beta-8995), shell fragment redeposited in Emerald Silt, thought to be glacially transported or otherwise reworked, borehole 5, Banquereau, Scotian Shelf, NS (44°25'N, 58°22'W; Amos and Knoll, 1987); similar sample dated 22 480 ± 470 (Beta-8996); published ages 24 410 ± 480 and 22 880 ± 470 not reservoir corrected.

25 860 ± 850 (Beta-8997), marine shell fragment redeposited in Emerald Silt, thought to be glacially transported or otherwise reworked, borehole 6, Banquereau, Scotian Shelf, NS (44°22'N, 58°02'W; Amos and Knoll, 1987); published age 26 260 ± 850 not reservoir corrected.

18 320 ± 1770 (Beta-9008), shell fragment redeposited in "barren gravel/sand," thought to be glacially transported or otherwise reworked, borehole 8, Banquereau, Scotian Shelf, NS (44°42'N, 57°51'W; Amos and Knoll, 1987); published age 18 700 ± 1770 not reservoir corrected.

17 920 ± 440 (Beta-15245), shell in glaciomarine sediment at 650 m water depth near Verrill Canyon on the Scotian Slope, NS (42°57'N, 61°40'W; Mosher et al., 1989); the dated unit extends upslope into wedges of incoherent reflections ..."genetically related to, and time equivalent with, the outer shelf tills;" taken as evidence that Late Wisconsinan ice extended to the edge of the shelf; published age 18 320 ± 440 not corrected for marine reservoir effect. [Plotted as M for maximum in histogram].

5. Northeastern Laurentide margin

32 370 ± 530 (AA-15696), shell fragment from 600 cm depth in core HU87-033-015, Karlsefni Trough, northern Labrador Shelf (Hall et al., 1999); foraminifera at 800 cm dated 27 015 ± 360 (AA-15697).

28 200 + 1200/-1000 (GX-8241), marine shells from interstadial marine sand above a shelly diamicton, Iron Strand, Labrador (Clark, 1988); site thought to lie beyond the Late Wisconsinan limit; current status unclear but presumably indicates that ice did not extend across the Labrador Shelf at this time; shells from diamicton dated 34 200 + 2100/-1600 (GX-8240) and shells from colluvium dated 34 360 ± 850 (SI-4131).

38 700 ± 1200 (AA-10232), single marine shell fragment from surface of till above postglacial marine limit, Wales Island, Hudson Strait (61°52'N, 72°04'W; Manley and Jennings, 1996).

33 320 ± 1810 (CAMS-19255), mixed foraminifera and marine shell, core HU93034-013, Hudson Strait (61°30.01'N, 70°43.41'W; Manley and Jennings, 1996); evidence of glacial readvance in this seismic section; possibly mixed Holocene and pre LGM material dated; not plotted on histogram.

34 790 ± 710 (AA-7899), marine shell fragment from glaciomarine sediment, probably glacially transported and redeposited, Bosanquet Harbour, Baffin Island, NU (62°38'N, 70°29'W; Manley and Jennings, 1996).

39 145 ± 1180 (AA-11452), marine shell fragment from the surface of till above postglacial marine limit, Gray Goose Islands, Baffin Island, NU (62°15.5'N, 68°23'W; Manley and Jennings, 1996).

35 280 ± 760 (AA-11451), marine shell fragment from the surface of till above postglacial marine limit, Wight Inlet, Baffin Island, NU (62°14'N, 68°13.5'W; Manley and Jennings, 1996); another shell from a similar site nearby dated 40 760 ± 1450 (AA-11453).

31 065 ± 455 (AA-11450), marine shell fragment from the surface of till above postglacial marine limit, Bond Inlet, Baffin Island, NU (62°12.5'N, 67°52.5'W; Manley and Jennings, 1996).

34 820 ± 730 (AA-12608), marine shell fragment from the surface of till above postglacial marine limit, Saddleback Island, Baffin Island, NU (62°09.3'N, 67°56.8'W; Manley and Jennings, 1996); another piece of same shell yielded a less reliable age of 24 035 ± 240 (AA-10647; not plotted on histogram).

38 620 ± 1110 (AA-14027), marine shell fragment redeposited in a postglacial delta probably following glacial transport, near Noble Inlet, Baffin Island, NU (Manley and Jennings, 1996).

24 780 ± 230 (AA-15132), marine shell fragment from the surface of till above postglacial marine limit, Lower Savage Islands, Baffin Island, NU (61°46.9'N, 65°47.6'W; Manley and Jennings, 1996).

34 710 ± 690 (AA-10646), marine shell fragment from glaciomarine sediment, probably glacially transported and redeposited, Bond Inlet, Baffin Island, NU (62°10'N, 67°44.4'W; Manley and Jennings, 1996).

37 760 ± 1050 (AA-12606), marine shell fragment from the surface of till above postglacial marine limit, Ashe Inlet, Baffin Island, NU (62°36'N, 70°32.3'W; Manley and Jennings, 1996); another shell fragment from this site dated 43 750 ± 2100 (AA-12605).

30 790 ± 450 (AA-10252), marine shell fragment from glaciomarine sediment, Balcom Inlet, Baffin Island, NU (62°19.5'N, 68°39.5'W; Manley and Jennings, 1996).

37 090 ± 1100 (AA-4244A), marine shell fragment from till, Nanook Harbour, Baffin Island, NU (62°03'N, 66°38'W; Kaufman and Williams, 1992); another shell fragment from this site dated 40 630 ± 1400 (AA-4244B).

39 000 ± 1800 (AA-2224), marine shell fragment from mud, probably glacially transported by ice flowing from Hudson Strait, Bond Inlet, Baffin Island, NU (62°13'N, 67°43'W; Kaufman and Williams, 1992).

32 500 + 2400/-1800 (GX-8591), marine shells from non-glacial raised delta, Loks Land, Baffin Island, NU (62°24'N, 64°26'W; Andrews and Short, 1983); delta originally thought to have lain beyond the LGM ice limit, but an overlying till now places it behind the limit of the Gold Cove Advance of Younger Dryas age.

37 200 ± 800 (QL-979), marine shells, mouth of Uga't northwest of Cape Dyer, Baffin Island, NU (66°44'N, 61°27'W; Miller, 1979); interpreted by Locke (1987) as postdating the maximum Early Wisconsinan advance of ice down the inlet.

36 600 ± 350 (QL-185), marine shells from deltaic sand, Cape Henry Kater, Baffin Island (69°09'N, 66°48'W; Andrews, 1976).

33 600 ± 300 (QL-136), in situ marine shells from an undisturbed raised delta, Kogalu River, Baffin Island (70°37'N, 69°10'W; Andrews, 1976); site beyond LGM ice limit.

40 000 ± 3000 (QL-184), fragmented marine shells from the surface, Clyde Fiord, Baffin Island (70°18.5'N, 68°59'W; Andrews, 1976).

36 250 + 3600/-2000 (I-2581), marine shells in a sandy delta between two end moraine ridges, mouth of Sam Fiord, Baffin Island (70°59'N, 70°37'W; Andrews and Drapier, 1967; Ives and Buckley, 1969); thought to provide age of lowest moraines extending to the fiord mouth.

33 100 ± 900 (GSC-1153), fragmented marine shells from sand and silt (colluvium?), Pond Inlet, Baffin Island (72°41'N, 78°00'W; Lowdon et al., 1971; Hodgson and Haselton, 1974); site revisited by A.S. Dyke in 1991; shells, fragments only, come from sand of a delta deposited at the mouth of a lateral meltwater channel; likely glacially transported and redeposited.

33 300 ± 800 (GSC-1964), marine shells, commonly broken but with some whole valves, from sand and silt, Pond Inlet airstrip, Baffin Island (Hodgson and Haselton, 1974); site revisited by A.S. Dyke in 1991, who interprets the site as the broad crest of a lateral moraine with a gravelly surface; shells are abundant in sand and silt, probably ice transported marine sediment, just below the gravel, but also in underlying till.

34 200 + 3400/-2400 (GSC-184), glacially transported marine shells from surface of a kame moraine well above postglacial marine limit, Mala River, Navy Board Inlet, Baffin Island (72°53'N, 80°46'W; Dyck et al., 1965).

35 400 + 2100/-1600 (GSC-188), glacially transported marine shells from surface of a kame well above postglacial marine limit, Jungerson Bay, Baffin Island (71°31'N, 84°33'W; Dyck et al., 1965; Dyke, 2000).

29 000 + 2200/-2000 (GaK-2568), fragmented marine shells (disturbed by bulldozer) from delta, mouth of Quajon Fiord, Baffin Island (67°56'N, 64°50'W; Pheasant and Andrews, 1973); thought

to relate to recession of ice from fiord mouth.

29 000 + 3500/-2000 (GaK-2567), in situ marine shells from a layer of marine sediment below till, outer Narpaing Fiord, Baffin Island (68°02.5'N, 65°04'W; Andrews and Miller, 1972); thought to be a minimum age because other correlative samples dated >29 000 BP.

28 200 ± 1500 (GaK-2799), in situ marine shells in sand overlying till and overlain by beach gravel, Cape Broughton, Baffin Island (67°38'N, 63°57'W; England and Andrews, 1973); no evidence that site was over-ridden by Late Wisconsinan ice.

32 200 + 1700/-1400 (I-3200), fragmented marine shells in coarse sand on or in and end moraine, Broughton Island, Baffin Island (67°34'N, 64°00'W, Andrews and Miller, 1972); interpreted as maximum age on last ice advance to the site.

24 100 ± 850 (S-459), marine shells in surficial sand in vicinity of an end moraine, Broughton Island, Baffin Island (67°34'N, 64°00'W).

36 300 ± 300 (QL-60), marine shells from sand overlying till, Cape Broughton, Baffin Island (67°38.38'N, 63°57.2'W; Andrews, 1976); three dates from this site in proper stratigraphic sequence based on very large samples extensively leached.

36 000 ± 300 (QL-182), marine shells from surface of probable lateral moraine comprised of reworked marine sediment (?), Kivitoo, Baffin Island (67°57'N, 64°52'W; Andrews, 1976).

32 300 ± 470 (CAMS-30537), macrofossil from base of 30-cm thick laminated silt in Fog Lake, Baffin Island (67°11'N, 63°15'W; 460 m asl; Steig et al., 1998); lake is dammed by glacial debris that lies above and beyond prominent lateral moraines along Padle Fiord and it was not overridden during LGM; the date marks the end of deposition of organic rich lake sediment, which resumed about 8.3 ka; the moraine damming the lake is assigned to the early Middle Wisconsinan (52-65k calendar years BP) on the basis of exposure dating (^{10}Be, ^{26}Al) but the change from inorganic to organic sedimentation marks the start of Late Wisconsinan climate deterioration; moraines at and below 120 m elevation are assigned to the Late Wisconsinan on the basis of exposure dating (10.2-21.5k calendar years BP).

>30 000 (Beta-1227) to 11 360 ± 170 (AA-5292), foraminifera in core HU84-008pc, Resolution Basin, southeastern Baffin Island Shelf adjacent to Hudson Strait (61°47.2'N, 63°49.9'W; Andrews et al., 1991); no evidence that site was overridden at LGM.

24 730 ± 420 (Beta-8898) to 13 225 ± 150 (AA-5063), foraminifera in core HU82-057pc, Resolution Basin, southeastern Baffin Island Shelf adjacent to Hudson Strait (61°46.8'N, 63°49.7'W; Andrews et al., 1991); no evidence that site was overridden at LGM.

21 100 ± 240 (AA-3338) and 19 460 ± 210 (AA-4700), foraminifera below and above a detrital carbonate layer, equivalent to H-2, in core HU75-55 at 2410 m water depth off Hudson Strait (Andrews et al., 1994); site is beyond LGM limit but record is interpreted as indicating discharge of ice bergs from Hudson Strait Ice Stream at a time when ice reached the Shelf edge. An overlying detrital carbonate layer, equivalent to H-1, is bracketed by dates on foraminifera of 14

610 ± 104 (AA-5999) and 13 235 ± 190 (AA-6851). [Dates (except AA-6851) plotted as M for maximum in histogram]

20 670 ± 220 (AA-13230) and 20 380 ± 260 (AA-18382), foraminifera below and above a detrital carbonate layer, equivalent to H-2, in core HU87-033-009 at 1437 m water depth off Cumberland Sound (Andrews et al., 1998; Jennings et al., 1996). Uncorrected ages are 21 070 ± 220 and 20 780 ± 260.

16 125 ± 140 (AA-13234), foraminifera at the top of lithofacies C (thin black mud layer) in core I77-1-2 at 880 m water depth on the continental slope off Cumber' d Sound and northeast of Hudson Strait (63°28.2'N, 59°06.5'W; Andrews et al., 1998); site is beyond LGM limit; black layer interpreted as indicating glacial erosion of Cretaceous mudstone in Cumberland Sound during brief intervals when ice extended to the shelf edge (edge of Baffin Shelf Drift) [date plotted as M for maximum in histogram]; a second black mud band below the dated one should date close to 18 ka; a detrital carbonate layer below that and possibly derived from Hudson Strait is taken as H-2. [Note that black bands do not appear to be correlative between adjacent cores; in neighbouring core I76-2-1, for example, there are no bands at 16 and 18 ka levels; there is one at 12 ka level in this core but not in I77-1-2. Some cores that span the same time interval evidently lack black bands. Also black bands and detrital carbonate layers tend to occur at different levels presumably indicating that advances to the mouths of Cumberland Sound and Hudson Strait were not synchronous]

6. Southwestern Innuitian Ice Sheet

38 590 ± 1340 (GSC-381), marine shells from surface of an ice-thrust moraine ridge, Brock Island, NT (77°58'N, 114°03'W; Lowdon et al., 1967).

27 860 ± 210 (TO-3561), marine shell fragment from surface approximately at marine limit, Brock Island, NT (Hodgson et al., 1994); probably glacier transported.

38 500 ± 1370 (GSC-3049), buried soil, Goodsir Inlet, Bathurst Island, NU (75°40'N, 97°41'W); overlying material not indicated; soil below present permafrost table.

7. Northwestern Innuitian Ice Sheet

28 800 ± 1800 (GSC-2044), marine shell (probably single valve, 4.2 g), Nansen Sound, Axel Heiberg Island, NU (81°01.5'N, 91°38'W; Blake, 1986; Bednarski, 1998); age unreliable due to small sample size. [Not plotted on histogram].

38 500 ± 1320 (GSC-4793), marine shells from silt and sand, Nansen Sound, Axel Heiberg Island, NU (80°42'N, 90°45'W; McNeely and Jorgensen, 1992; Bednarski, 1998).

29 640 ± 250 (TO-2281), shell fragment, probably glacially transported, Schei Peninsula, Axel Heiberg Island, NU (80°24'N, 88°16'W; Bednarski, 1998).

38 010 ± 590 (TO-420), marine shell fragment in sand below till, Otto Fiord, Ellesmere Island, NU (81°04'N, 87°25'W; Bednarski, 1995).

37 130 ± 430 (TO-663), marine shell fragment in till, Hare Fiord, Ellesmere Island, NU (80°44'N, 87°48'W; Bednarski, 1995).

35 020 ± 640 (TO-661), marine shell fragment in till, Otto Fiord, Ellesmere Island, NU (81°04'N, 87°25'W; Bednarski, 1995).

34 800 ± 400 (TO-421), marine shell in silt below till, Otto Fiord, Ellesmere Island, NU (81°04'N, 87°25'W; Bednarski, 1995); believed to be as old as Pliocene on basis of amino acid ratios.

26 090 ± 210 (TO-667), marine shell fragment in till, Hare Fiord, Ellesmere Island, NU (80°38'N, 86°25'W; Bednarski, 1995); believed to be older on basis of amino acid ratios.

8. Central Innuitian Ice Sheet

38 200 ± 1510 (GSC-4635), terrestrial organic debris (bryophytes), Canon Fiord, Ellesmere Island, NU (80°12'N, 81°36.75'W; McNeely and Jorgensen, 1992).

38 070 ± 410 (TO-1283), marine shell in silt below till, Greely Fiord, Ellesmere Island, NU (80°22'N, 81°56'W; England, 1990).

22 900 ± 90 (TO-444), marine shell from surface of till, Greely Fiord, Ellesmere Island, NU (80°22'N, 81°56'W; England, 1990).

38 200 ± 1510 (GSC-4635), plant detritus in bottomset sand of a marine delta, Canon Fiord, Ellesmere Island, NU (80°12'N, 82°36'W; England, 1990).

38 010 ± 410 (TO-1284), marine shell in growth position in silt, Canon Fiord, Ellesmere Island, NU (80°10'N, 82°50'W; England, 1990).

33 300 ± 700 (TO-449), plant detritus in lacustrine sand, Greely Fiord, Ellesmere Island, NU (80°36'N, 81°55'W; England, 1990).

25 000 ± 1740 (GSC-2721), marine shell fragments (7.9 g) from silty sand, Cape Butler, Cornwall Island, NU (77°29.5'N, 95°33'W; McNeely, 1989); age may be anomalous due to small sample size and possibility of mixing of postglacial and older shells; not plotted on histogram.

37 280 ± 1000 (AA-23577), marine shell from till surface above postglacial marine limit, Cornwall Island, NU (77°45'N, 94°47'W; Lamoureux and England, 2000).

30 710 ± 350 (TO-5616), marine shell from till surface above postglacial marine limit, Cornwall Island, NU (77°42'N, 94°40'W; Lamoureux and England, 2000).

38 820 ± 540 (Beta-111708), marine shell from till surface above postglacial marine limit, Cornwall Island, NU (77°35'N, 95°11'W; Lamoureux and England, 2000).

35 750 ± 490 (Beta-111710), marine shell from till surface above postglacial marine limit, Cornwall Island, NU (77°36'N, 95°52'W; Lamoureux and England, 2000).

30 100 ± 750 (GSC-2700), marine shells from surface of gravelly silt, Baumann Fiord, Bjorne Peninsula, Ellesmere Island, NU (77°29'N, 85°45'W); probably ice transported.

36 160 ± 430 (TO-5615), marine shell from till surface above marine limit, Blind Fiord, Ellesmere Island, NU (78°09'N, 86°46'W; O'Cofaigh, 1998).

36 910 ± 410 (TO-5600), marine shell from till surface above marine limit, Blind Fiord, Ellesmere Island, NU (78°09'N, 86°46'W; O'Cofaigh, 1998).

35 310 ± 400 (TO-5602), marine shell from till above marine limit, Bear Corner, Ellesmere Island, NU (78°10'N, 87°24'W; O'Cofaigh et al., 2000).

37 130 ± 1000 (AA-23607), marine shell from till surface above marine limit, Bay Fiord, Ellesmere Island, NU (78°54'N, 85°00'W; O'Cofaigh et al., 2000); other shells from this site dated 33 030 ± 610 (AA-23608) and 38 490 ± 1100 (AA-23609).

27 380 ± 360 (AA-23605), marine shell from till surface above marine limit, Bay Fiord, Ellesmere Island, NU (78°51'N, 84°32'W; O'Cofaigh et al., 2000); another shell from this site dated 37 910 ± 960 (AA-23606).

34 830 ± 850 (AA-23601), marine shell from outwash gravel above marine limit, Bay Fiord, Ellesmere Island, NU (78°50'50"N, 84°33'W; O'Cofaigh et al., 2000); other shells from this site dated 30 930 ± 420 (AA-23602) and 35 510 ± 730 (AA-23603).

9. Southeastern Innuitian Ice Sheet

39 900 ± 1800 (GSC-6194), marine shells probably redeposited in postglacial delta, Viks Fiord, Devon Island, NU (75°53.36'N, 90°14.41'W; Dyke, 1999).

23 200 ± 290 (GSC-5848), marine shells redeposited in postglacial sediment, Croker Bay, Devon Island, NU (74°36'18"N, 83°37'43"W; Dyke, 1999); three individual shells from this sample were dated as follows: 27 240 ± 270 (TO-4879), 23 830 ± 250 (TO-5152), and 25 410 ± 510 (TO-5153).

39 700 ± 1300 (GSC-829), marine shells from the surface of till above the limit of postglacial beaches, Andersrag Beach, Ellesmere Island, NU (76°25'N, 87°36'W; Blake, 1987).

35 800 ± 1080 (GSC-2584-3), marine algae fragments from sand below Holocene raised beaches, Andersrag Beach, Ellesmere Island, NU (76°24'N, 87°34'W; Blake, 1987; 1996); three determinations on this material each yielded finite ages, with age decreasing as sample size was increased; marine shells from the same bed dated 40 500 ± 1660 (GSC-2786), 27 700 ± 480 (GSC-1409), 38 300 ± 1360 (GSC-1880), 42 500 ± 1900 (GSC-2310), 40 500 ± 740 (GSC-2485), 40 800 ± 1350 (GSC-2800); a whale rib from this unit dated 39 130 ± 550 BP (TO-5241) and the sternum on an Alcidae dated 35 560 ± 1550 (Ua-2212)

31 600 ± 1120 (GSC-4310), in situ marine shells in coarse sand, Cadogan Inlet, Ellesmere Island, NU (78°13.5'N, 75°47.0'W; Blake, 1987; 1992); evidently not overlain by till; second determination 38 540 ± 460 (TO-969).

31 100 ± 480 (GSC-3364), willow twigs in water washed sand below till near Glacier 7A-45, Makinson Inlet, Ellesmere Island, NU (77°49.8'N, 81°45'W; Blake, 1992). Sedge rhizomes in this sand dated 19 790 ± 300 (TO-2690), 20 240 ± 310 (TO-1300), and 34 270 ± 380 (TO-2018), and a moss stem dated 35 460 ± 1370 (TO-3316). Ice caps on Ellesmere Island not appreciably larger than present at this time.

38 200 ± 1240 (GSC-3427), wood (Salix sp.) fragments from organic debris exposed in the snout of Webber Glacier, Ellesmere Island, NU (80°53'N, 82°15'W; Blake, 1987); same sample dated 37 550 ± 1420 by Heidelberg (H 5607-5148) and a single fragment dated 46 460 ± 520 (TO-191).

31 050 ± 860 (Ua-2210), marine shell fragment from till, above marine limit, Cape Herschel plateau, Ellesmere Island, NU (78°36'N, 74°36'W; Blake, 1992). Other shells same site dated 30 350 ± 800 (Ua-2209) and 28 900 ± 240 (TO-1268).

28 560 ± 240 (TO-228), marine shell fragment from till, above marine limit, west of Cape Herschel, Ellesmere Island, NU (Blake, 1992).

31 990 ± 290 (TO-924), marine shell from lateral moraine of Leffert Glacier, Ellesmere Island, NU (Blake, 1992); ice not appreciably larger than present at that time.

10. Northeastern Innuitian Ice Sheet

24 680 ± 180 (TO-2913), marine shell from deltaic sand and gravel, Panikpah River, Ellesmere Island, NU (81°03'N, 66°45'W; England, 1996).

29 010 ± 280 (TO-2916), marine shell from silt, Panikpah River, Ellesmere Island, NU (81°02'N, 66°40'W; England, 1996).

26 520 ± 170 (TO-2921), marine shell in silt, Valley D-4, Ellesmere Island, NU (80°42'N, 68°29'W; England, 1996).

39 470 ± 510 (TO-3484), marine shell in sand, Rawlings Bay, Ellesmere Island, NU (80°21'N, 69°35'W; England, 1996).

27 030 ± 210 (TO-3483), marine shell from surface, Rawlings Bay, Ellesmere Island, NU (80°21'N, 69°34'W; England, 1996).

24 580 ± 210 (TO-4203), marine shell from till, Radmore Harbour, Ellesmere Island, NU (80°31'N, 70°38'W; England, 1996); another sample 28 160 ± 970 (TO-4204).

39 900 ± 530 (TO-3476), marine shells from silt, Kane Basin, Ellesmere Island, NU (80°13'N,

70°07'W; England, 1996); another sample 34 190 ± 350 (TO-3768).

38 120 ± 450 (TO-3478), marine shells from silt, Kane Basin, Ellesmere Island, NU (80°13'N, 70°03'W; England, 1996); another from sand 37 560 ± 460 (TO-3479).

24 250 ± 190 (TO-4202), marine shell from till, Scoresby Bay, Ellesmere Island, NU (79°52'N, 71°28'W; England, 1996).

31 400 ± 900 (TO-5663), marine shell from silt, Dobbin Bay, Ellesmere Island, NU (79°47'N, 74°54'W; England, 1996).

27 270 ± 510 (TO-4196), marine shell from till, Franklin Pierce Bay, Ellesmere Island, NU (79°24'N, 74°50'W; England, 1999).

19 030 ± 140 (TO-5591), marine shell from till, Flagler Bay, Ellesmere Island, NU (79°08'N, 76°53'W; England, 1999).

22 690 ± 170 (TO-5601), marine shell from till, Flagler Bay, Ellesmere Island, NU (79°06'N, 75°57'W; England, 1999).

32 040 ± 310 (TO-5607), marine shell from till, Hayes Fiord, Ellesmere Island, NU (79°01'N, 76°33'W; England, 1999).

39 060 ± 550 (TO-5593), marine shell from foreset beds below till, Cook Peninsula, Ellesmere Island, NU (79°31'N, 76°16'W; England et al., 2000). A shell fragment from the till surface dated 33 800 ± 410 (TO-5611).

33 310 ± 400 (Beta-119911), marine shell fragment from till surface, Knud Peninsula, Ellesmere Island, NU (79°09'N, 76°55'W; England et al., 2000).

38 070 ± 760 (Beta-119909), marine shells from sand, Koldewey Point, Ellesmere Island, NU (79°06'N, 75°44'W; England et al., 2000); another sample 22 510 ± 150 (TO-5858).

36 940 ± 460 (TO-5614), marine shell from silt, Copes Bay, Ellesmere Island, NU (79°30'N, 76°17'W; England et al., 2000).

36 570 ± 530 (Beta-111702), marine shell from sand and gravel, Bache Peninsula, Ellesmere Island, NU (79°01'N, 74°34'W; England et al., 2000).

32 040 ± 310 (TO-5607), marine shell from sand and gravel, Thorvald Peninsula, Ellesmere Island, NU (79°01'N, 76°33'W; England et al., 2000).

37 260 ± 470 (TO-4205), tundra plant detritus (*Cassiope tetragona*) forming lenses in sediments of glacial Lake Hazen, Ellesmere Island, NU (81°54'N, 69°47'W; Smith, 1999); ice cover on northern Ellesmere Island not appreciably larger than present when the plants were growing.

27 170 ± 210 (TO-860), marine shell from silty sand at the edge of a delta terrace at 117 m

elevation, Sentinel Valley, Marvin Peninsula, Ellesmere Island (ca 83°02'N, 75°55'W; Lemmen, 1989); shell fragments from the delta surface dated 32 010 ± 300 (TO-486). The delta lies above the apparent postglacial marine limit and may lies slightly beyond the LGM ice limit; alternatively the shells may have been redeposited in a glaciofluvial terrace. Either way, the dates provide maximum limiting ages on the last ice advance locally.

15 710 ± 180 (TO-497), bryophyte fragments redeposited in postglacial marine sand dated 8.9 ka, M'Clintock Inlet, Ellesmere Island, NU (82°38'N, 75°38'W; Lemmen, 1989); second smaller sample dated 14 730 ± 120 (TO-498); site only few kilometres beyond extant glaciers; hence, ice not appreciably larger than present about 16 ka BP and LGM locally attained after that time.

23 340 ± 430 (TO-489), bryophyte fragments redeposited in postglacial marine sand dated 9 ka, Cape Discovery, Ellesmere Island, NU (83°00'N, 75°39'W; Lemmen, 1989).

31 360 ± 400 (TO-492), bryophyte fragments redeposited in postglacial sand, Disraeli Fiord, Ellesmere Island, NU (82°36'N, 73°13'W; Lemmen, 1989); site within few kilometres of extant glaciers.

30 440 ± 330 (TO-500), marine shell fragment in glaciomarine sediment, Disraeli Fiord, Ellesmere Island, NU (82°50'N, 73°49'W; Lemmen, 1989); probably redeposited.

20 240 ± 160 (TO-481), marine shell fragment in postglacial delta dated about 9 ka, Wootton Peninsula, Ellesmere Island, NU (82°21'N, 85°20'W; Evans, 1990).

14 880 ± 110 (TO-475), marine shell fragment or fragments, likely ice transported, in glaciomarine sediment forming a morainal bank, mouth of Phillips Inlet, Ellesmere Island, NU (82°04'N, 87°53'W; Evans, 1990); unfortunately it is not clear whether one or more fragments of shell were used for this age determination; if the former, then ice was advancing to its LGM limit in this region at 14.9 ka or later; if the latter the determination may result from an artificial blend of Holocene and much older shells. **[John E, can you inquire about this one?]**

B. Minimum limiting radiocarbon dates on retreat from LGM

Note: (a) anomalous and ambiguous dates are in bold, and (b) marine shell dates are reported with a reservoir correction of -400 years where the reporting protocol is known; otherwise shell dates are listed as in sources.

1. Northwestern Laurentide limit

26 900 ± 1560 (GSC-2780), basal lake sediment, lake BK4, Nelson Head, Banks Island, NT (71°21'N, 122°30'W; Blake, 1987); lake occupies a meltwater channel cut in Jesse Till assigned to the Early Wisconsinan by Vincent (1983) but to the Late Wisconsinan by Dyke and Prest (1987) and this report; abundant pre-Quaternary wood, lignite, shale in region suggests that the age is probably anomalously early; sediment higher in this core dated 34 100 ± 1060 (GSC-3819) and 14 600 ± 190 (GSC-3827).

22 400 ± 240 (GSC-1262), fragmented plant remains from a 1.5 m below the top of a bed of fine sand which underlies 1.5 m of pebbly gravel, Stokes Point, YT (69°15'N, 138°48'W; Lowdon and Blake, 1976; Rampton, 1982); used as minimum age for westernmost Buckland Drift by Dyke and Prest (1987) and Lemmen et al. (1994); however, exact provenance of the dated material is uncertain due to the fact that the sample was collected by J.G. Fyles in 1965, when the section was poorly exposed, whereas the stratigraphy was described by Rampton in 1972; dated material though to represent deposition in a thermokarst lake; however, this is much earlier than any other dated evidence of thermokarst in the region; dated sequence is presumed to overlie till or glacially contorted preglacial sediment.

16 200 ± 150 (RIDDL-765), bone of extinct horse (Equus lambei) from colluvial sand overlying Buckland Drift (ice thrust sediment), Hershel Island, YT (69°37'N, 138°56'W; Harington, 1989).

21 300 ± 270 (GSC-3371) and **21 200 ± 240** (GSC-3813), organic detritus from glacial lacustrine silt overlying Buckland Drift, Rat River, NT (67°43'N, 135°51'W); cited as minimum date on deglaciation of site near LGM limit by Vincent (1989) and Lemmen et al. (1994) but as date on advance to LGM limit short of Buckland Drift limit by N. Catto (in McNeely, 1989); because dated material is detrital, the lake sediment could be younger. Catto's interpretation in better agreement with youngest dated materials below Glacial Lake Old Crow sediments.

19 630 ± 1600 (WAT-742), organic matter (?) from stony clay in core from Illisarvik Lake, Richards Island, NT (69°28'N, 134°43'W; Michel and Fritz, 1982); surface sediment dates 2320 ± 70 (WAT-746) indicating hardwater error which may be larger in basal sediments with low organic content.

19 400 ± 290 (I-8578), mammoth bone from Pleistocene deposits at Tununuk, Richards Island, NT (69°00'N, 134°40'W; Harington, 1978); date cited as minimum for deglaciation by Lemmen et al. (1994) and by Dallimore et al. (1997); however, stratigraphic origin of the bone is unclear and it may have come from sub-till sediments of the eolian Kittigazuit sands, which are widespread in the region; two AMS dates on mammoth teeth from Richards Island, definitely not of postglacial age and probably from Kittigazuit sand, yielded ages close to 40 000 years (see

above) suggesting that I-8578 may be erroneously young.

17 860 ± 260 (GSC-481), peat pod in pebbly clay silt uplifted in Ibyuk Pingo near Inuvik, NT (69°24'N, 133°04'W); commonly used as a minimum date for deglaciation but problematic (Lowdon and Blake, 1973; Rampton, 1988, Lemmen et al., 1994); basal unit in this exposure contains lenses of wood that yield infinite radiocarbon ages (GSC-485, -486) and a date on organic silt from 25 cm lower in the bed from which GSC-481 was collected gave an age of **14 130 ± 440** (GSC-512); strong possibility, therefore, that one or both of GSC-481 and GSC-512 result from combination of postglacial and older organic materials.

16 000 ± 420 (GSC-2690), basal organic silt in a moraine dammed lake in Doll Creek valley, NT (66°02'N, 135°42'W) close to Buckland Drift limit (Ritchie, 1982). Although date is not problematic early for deglaciation of this site, the organic content of the dated sediment was <1.6% (R. McNeely, pers. comm, 2000); GSC lab now regards dates on samples with <5% organic content as probably unreliable.

15 500 ± 440 (GSC-3646), organic silt and clay from 278.5-283.5 cm depth in Kate's Pond, NT (68°22'N, 133°20'W); problematic minimum date for deglaciation because sediment from 350-356.5 cm in same core gave an age of 13 800 ± 190 (GSC-3645); in a second core from this lake sediment from 283.5-288.5 cm dated **14 100 ± 340** (GSC-3570) whereas sediment from 356.5-363.5 cm dated 8910 ± 100 (GSC-3554); bulk total organic carbon dates on lakes from this region of carbonate bedrock should probably be regarded as generally unreliable.

15 200 ± 230 (GSC-2758), basal organic silt in Lateral Pond, NT (65°57'N, 135°31'W) lying between two lateral moraines on Buckland Drift. Although date is not problematic early for deglaciation of this site, the organic content of the dated sediment was <3% (R. McNeely, personal communication, 2000); GSC lab now regards dates on samples with <5% organic content as probably unreliable.

14 600 ± 200 (GSC-3483), basal organic silt in Reindeer Lake, NT (69°07'N, 132°17'W); dates on this core are in proper sequence; however, sediments are highly calcareous, hence probability that basal date is too old; furthermore the organic content of the dated sample was only 1.6% (R. McNeely, personal communication, 2000); GSC lab now regards dates on samples with <5% organic content as probably unreliable.

14 410 ± 110 (BGS-143), basal limnic peat near Peel River, NT (65°59'N, 135°03'W; Zoltai and Tarnocai, 1975); possible hardwater effect if date on aquatic moss.

14 400 ± 180 (GSC-1792), peat from pods in contact zone between oxidized diamicton and overlying lacustrine silty clay, Sabine Point, YT (69°04.5'N, 137°51'W; Rampton, 1982); possible hardwater effect if date on aquatic moss.

14 100 ± 170 (GSC-1784), fibrous organic material from large crossbed in outwash sand, Eskimo Lakes, NT (69°04'N, 132°43'W; Rampton, 1988); contains some reworked amber, wood, and plant fragments derived from erosion of older strata; second dating of this sample using only grass and sedge yielded preferred age of 12 900 ± 150 (GSC-1784-2); grass and sedge separated from another sample from the same deposit gave an age of 13 000 ± 130 (GSC-1995).

2. Southwestern Laurentide margin

19 860 ± 210 (WIS-1905), basal organic clay, Cottonwood Lake, SD (44°28'N, 99°55'W; Radiocarbon 30); Clayton and Moran (1982) assigns the underlying drift to the Early Wisconsinan; if correct, date does not pertain to deglaciation.

14 860 ± 140 (WIS-1770), basal silty marly clay, Guardipee Lake, MT (48°33.5'N, 112°43'W; Barnosky, 1989); anomalously old; overlies Mt St Helens Jy tephra, so true age about 11 ka.

17 040 ± 210 (WIS-1791), basal sediment, Lost Lake, MT (47°38'N, 110°29'W; Barnosky, 1989); anomalously old; Ruppia seeds about 50 cm lower in core dated 9235 ± 150 BP (Beta-21578); located at LGM limit.

34 900 + 3000/-2200 (I-1878), charcoal from colluvium overlying till, Irving, AB (49°55'N, 110°24W; Bik, 1969; Jackson, 1983; Fullerton and Colton, 1988); probably contaminated by lignite, which is common in the area.

20 600 ± 410 (I-2607), plant detritus and charcoal from postglacial stream terrace sands, Manyberries, AB (49°55'N, 110°36'W; Bik, 1969; Jackson, 1983; Fullerton and Colton, 1988); probably contaminated by lignite, which is common in the area.

23 600 ± 260 (GSC-3662), lower sediment, Goldeye Lake, AB (52°27'N, 116°12'W; McNeely, 1989); two dates lower in core and older were rejected because of high percentages of pre-Quaternary pollen; GSC-3662 was accepted based on low percentage of pre-Quaternary pollen and seen as support for ice-free corridor at LGM; coal occurs in local bedrock and age is probably unreliable because of this.

18 400 ± 1090 (GSC-2670), aquatic moss from basal lake sediment, Chalmer's Bog, AB (50°39.5'N, 114°33.5'W; Lowdon and Blake, 1979; Mott and Jackson, 1982); originally used as evidence that an ice-free corridor existed between Laurentide and Cordilleran ice in this region, now recognized as several thousand years too old due to hard water effect (MacDonald et al., 1987).

17 960 ± 160 (TO-574), basal lake sediment, Mitchell Lake, AB (52°13'N, 115°00'W; Schweger and Hickman, 1989); anomalously early.

17 750 ± 650 (WAT-406), near basal sediment, Boone Lake, AB (55°34'N, 119°26'W; White et al., 1979); basal sandy pebbly clay dated >30 000 (WAT-361); originally taken as evidence of an ice-free corridor existed between Laurentide and Cordilleran ice in this region, now recognized as several thousand years too old due to hard water effect.

14 340 ± 100 (TO-310), silty peat, Robsart, SK (49.223°N, 109.175°W; Klassen and Vreeken, 1987; Klassen, 1994); a date on wood slightly higher in core of 9560 ± 80 (GSC-4098) suggest hard water effect in TO-310.

14 040 ± 465 (S-685), bone in gravel below 1 m of boulders, Sutherland, SK (52°12'N, 106°35'W; Christiansen, 1979); date considered unreliable by Clayton and Moran (1982) because

of evidence of over-ridden forest in Iowa as late as 12.3 ka.

14 300 ± 320 (GSC-1369), organic detritus from 323-326 cm depth in a fluviolacustrine terrace of early Lake Agassiz, Thornhill, MB (49°13.7'N, 98°13.6'W; Lowdon and Blake, 1976); date is problematic early for deglaciation of this site because of evidence of younger ice advances (12.3 ka) in South Dakota and Iowa (Clayton and Moran, 1982).

14 690 ± 390 (W-1763), basal silty sediment, Weber Lake, MN (47°25'N, 91°40'W; Fries, 1962; Wright, 1976); no conflict with chronology of Clayton and Moran (1982).

15 250 ± 220 (I-5051), basal sediment, White Lily Lake, MN (46°N, 93°W; Birks, 1976).

15 850 ± 240 (I-5048), basal clay, Kylen Lake, MN (47°20'N, 91°48'W; Birks, 1981); site ice covered at 15 ka according to wood-based chronology of Clayton and Moran (1982) and Mickelson et al. (1983).

16 150 ± 550 (W-1973), basal organic detritus, Kotiranta Lake, MN (46°42'32"N, 92°35'W; Wright et al., 1973); kettle in outwash from Thompson Moraine; rejected as too old by Wright and Watts (1969) and seemingly too old for the wood-based chronology of Clayton and Moran (1982).

20 500 ± 400 (I-5443), basal lake sediment, Wolf Creek, MN (46°07'N, 94°07'W; Birks, 1976; Wright, 1976); anomalously old according to wood-based chronology of Clayton and Moran (1982) and Mickelson et al. (1983); pre-Quaternary microfossils common in sediment; Matsch and Schneider (1988) plot this date above Pierz Till and below (beyond?) Brainerd Till.

16 500 ± 1500 (QL-), surface organic deposit overlying Cromwell Formation Independence Till of the Superior Lobe, MN (Matsch and Schneider, 1988); a second date in same position is 16 050 ± 230 (QL-).

14 500 ± 340 (I-1414), basal muck, McCulloch Bog, IA (42°55'N, 93°43'W; Brush, 1967); anomalously old for Altamont and Bemis moraines, site should have been deglaciated after 14 ka according to the wood-based chronology of Clayton and Moran (1982).

3. Southern Laurentide margin

15 560 ± 115 (WIS-442), basal gyttja, Disterhaft Bog, WI (43°55'N, 89°10'W; West, 1961); seems too old by chronology of Clayton and Moran (1982) and regarded as anomalously old by Black (1976).

15 940 ± 150 (WIS-1519), basal clay, Hook Lake Bog, WI (42°57'N, 89°20'W; Steventon and Kutzbach, 1985); just behind Johnstown Moraine? Although date not described as anomalous, sediment description suggests low organic carbon content; first date up core is 12 410 ± 120 (WIS-1604) on clayey gyttja. In nearby Washburn Bog spruce wood from 1117-1118 cm depth dated 11 260 ± 100 (WIS-1520) whereas organic clay and sand from 1119-1147 dated 13 500 ± 120 (WIS-1521), suggesting a hardwater effect on the sediment date.

16 440 ± 190 (WIS-1458), basal silt-clay, Lake Mendota, WI (43°06'N, 89°25'W; Winkler et al., 1986); just behind Johnstown Moraine? Possible hardwater effect because of calcareous drift.

25 700 ± 460 (WIS-1278), basal very calcareous sediment, Lima Bog, WI (42°48'N, 88°05'W; Radiocarbon 26); anomalously old; just beyond Lake Border Moraine. Other anomalous near basal dates from this core are 18 090 ± 190 (WIS-1426; Radiocarbon 26) and 16 600 ± 160 (WIS-1425; Baker et al, 1992).

14 450 ± 145 (WIS-2224), basal silty clay, Chub Lake WI (43°13'N, 88°53'W; Radiocarbon 34); possible hardwater effect.

16 580 ± 120 (WIS-1515), basal peat grading into clay at 757-773 cm depth, Leopold Marsh, WI (43°33"N, 89°39'W; Steventon and Kutzbach, 1985); just behind LGM limit. Sample of fibrous peat directly above (752-757 cm) dated 13 130 ± 120 (WIS-1551), suggesting very slow accumulation or hard water error in basal date.

15 240 ± 120 (ISGS-465), lake clay with peat enclosing mammoth bones; located on Valparaiso outwash, DuPage County, IL (41°50'52"N, 88°11'42"W; Springer and Flemal, 1981); bone apatite was dated 13 130 ± 350 (ISGS-485); collectors prefer the bone date as best according with local glacial history; however, Johnson (1986) considers the sediment date more accurate. Hansel and Johnson (1992) describe the dated material as "organic material in proglacial lacustrine sediment above proglacial fluvial sediment of Haeger Member at the margin of the West Chicago moraine." The date provides a minimum age on that moraine.

14 380 ± 150 (ISGS-527), basal marly sediment, Chatsworth Bog, IL (40°40'32"N, 88°20'34"W; King, 1981); minimum for Chatsworth Moraine but probably includes a hard water effect.

14 100 ± 640 (ISGS-1570), driftwood from beach sand of Glacial Lake Chicago behind Valparaiso Moraine, near Chicago, IL (Hansel and Johnson, 1992).

17 690 ± 270 (ISGS-767), organic detritus (twigs and root fragments) from a kettle on Batestown Till, IN (40°05'50"N, 88°10'10"W; Johnson, 1986; cited as ISGS-798 in text but ISGS-767 on chart 1 of that reference.

14 080 ± 150 (ISGS-502), basal marl, Christienson Mastodon site, IN (39°52'N, 85°49.5'W); probably too old because of hard water effect.

14 660 ± 200 (UM-2559), basal peat, Union City Moraine, Muncie, IN (39°47'N, 84°52'W; Hood et al., 1983).

16 680 ± 1240 (SI-1361), basal organic clay, Browns Lake, OH (40°41'N, 82°04'W; Shane, 1987); 16 km north of LGM limit on till thought to predate Erie Interstade; overlying date on pine pollen rise >500 years too old due to hardwater effect.

14 160 ± 483 (OWU-91), basal organics, Torrens Bog, OH (40°30'N, 82°10'W; Ogden, 1965).

15 570 ± 340 (ISGS-252), basal gyttja mixed with marl, Battaglia Bog, OH (41°08'38"N,

81°19'43"W; Shane, 1975, 1987; Shane and Anderson, 1993); located 30 km north of LGM limit and south of the Defiance Moraine. Could be too old due to hard water effect (Shane and Anderson, 1993).

14 500 ± 150 (ISGS-402), basal spruce litter layer, Quillon site, OH (41°00'37"N, 81°58'35"W; Shane, 1987).

14 810 ± 170 (DIC-243), basal clay gyttja, Carter site, OH (40°13'N, 84°14'W; Shane, 1987); minimum for Union City Moraine.

14 890 + 380/-410 (DIC-510), basal clay gyttja, Stotzel-Leis site, OH (40°13'N, 84°14'W); minimum for Union City Moraine; possibly too old due to hardwater effect (Shane and Anderson, 19930.

14 680 ± 310 (ISGS-1679), basal sediment, Ladd Lake, OH (ca 41°25'N, 84°46'W); reported in Lowell and Stuckenrath (1990); possibly too old due to hardwater effect; first date up-core thought to be about 500 years too old for same reason (Shane and Anderson, 1993).

14 300 ± 450 (W-198), wood in basal lacustrine silt in depression on till on top of the Wabush Moraine, Edon, OH (Goldthwait, 1958; Mickelson et al., 1983; see Rubin and Suess, 1955; Science 121, p. 481 for co-ordinates; ca 41.9°N, 84.4°W).

14 290 ± 130 (ISGS-72), wood in basal sediment in depression on till, OH (40°57'15"N, 82°32'55"W; Mickelson et al., 1983; see Colman, 1973 or Totten, 1973)

14 050 ± 75 (ISGS-348), wood from basal sediment in depression on till, Medina County, OH (41°00'39"N, 81°58'38"W; Mickelson et al., 1983; Liu and Coleman, 1981; see Totten, 1976; GSA Abstracts 8, p. 514).

17 240 ± 340 (ISGS-1664), basal clay gyttja, Bucyrus Bog, OH (40°47'50"N, 82°56'W; Shane, 1989); anomalously old; located on the St Johns Moraine thought to have been deglaciated about 14.8 ka; rejected as too old by Shane and Anderson (1993) because of either a hardwater effect or redeposition of organic matter; first date up-core is 12 890 ± 160 (ISGS-1663).

15 315 ± 625 (OWU-190), spruce wood from lake clay, Akron, OH (41°10'N; 81°30'W; Radiocarbon 11); same log redated 13 300 ± 600 (M-1971), in closer agreement with associated bone.

16 650 ± 1800 (BGS-86), wood at the base of a kettle hole bog near Chenago Forks, NY (Cadwell, 1978; note lab number quoted as BS-86); reported to be on Broome Till or Mohawk Till (Fullerton, 1986; citing Cadwell, 1973).

14 900 ± 450 (I-4216), peat and spruce wood from marly silt overlying outwash, Nichols Brook, NY (42°32'41"N, 78°28'44"W; Calkin and McAndrews, 1980); 3 km south of Escarpment Moraine.

15 300 ± 190 (I-5713), peat below marl, South Dansville, NY (42°29'44"N, 77°38'39"W);

minimum for Arkport Drift just south of Valley Heads Moraine (Fullerton, 1988); possible hard water effect.

14 175 ± 100 (SI-3098), basal gyttja, Rose Lake, PA (41°55'N; 77°56'W; Crowl, 1980; Cotter and Crowl, 1981); located close to LGM limit.

15 910 ± 160 (WIS-1925), basal silt, Spring Lake, PA (41°37'N, 76°20'W; Barnosky et al., 1988); located about 50 km north of LGM limit and 50 km south of Valley Heads Moraine; silt inclosed a mammoth bone which dated 14 240 ± 150 (WIS-1935)

14 000 ± 350 (W-365), basal marl, Corry Bog, PA (41°55.5'N, 79°40'W; Crowl, 1980; Karrow et al., 1984); anomalously old due to hard water effect.

15 180 ± 160 (BGS-266), basal clay gyttja, Lake Hunger, ON (42°57'55"N, 80°28'W: Winn, 1977); site submerged during Lake Maumee III, hence true age probably about 14 ka or slightly less (Karrow, 1989).

14 290 ± 170 (Beta-19152), basal gyttja, Miron Lake near Verner, ON (46°25.25'N, 80°04.17'W; McNeely and Jorgensen, 1993); organic content <1%; anomalously old; true age less than 11 ka.

5. Southeastern Laurentide margin

18 570 ± 250 (SI-5273), basal clastic sediment, Francis Lake, NJ (41°15'N, 74°45'W; Cotter et al., 1984); located just behind LGM limit; base of organic rich sediment dated 13 510 ± 135 (SI-5300); minimum age for Budd Lake Moraine; very low organic content suggests probability of age being too old.

14 720 ± 260 (I-4162), basal peat, Glovers Pond, NJ (40.94°N, 74.89°W; Crowl and Stuckenrath, 1977); site near LGM limit.

17 950 ± 620 (I-4935), glaciolacustrine sediment, lower Hudson River Channel, NY (Stone and Borns, 1988 citing Weiss, 1971, Ph.D. thesis); just behind LGM limit; note there is no mention of this date in Weiss (1974), whose records start at about 13 ka BP; date appears to be on bulk sediment and is probably too old.

14 970 ± 260 (W-4564), unspecified postglacial material, Martha's Vineyard, MA (Stone and Borns, 1988); near LGM limit.

14 000 ± 130 (WIS-1122), basal organic silt, Hawley Pond Bog, MA (42°34'N, 72°53'W; Bender et al., 1981).

14 420 ± 300 (Y-2420), marine shells in raised delta, West Lynn, MA (42°28'N, 70°59'W; Kaye and Braghorn, 1964); shells from same deposit dated 14 250 ± 250 (W-735).

15 300 ± (W-1187), tundra leaves, Zacks Cliffs, Martha's Vineyard, MA (41.4°N, 70.6°W; Oldale, 1982); a second sample of leaves dated 14 970 ± 260 (W-4564); LGM limit.

21 200 ± 1000 (W-544), horncore of extinct bison (Bison crassicornis) from gravel in a kame terrace, Harvard MA (42°30'N, 71°35'W; Radiocarbon 2); believed to date recessional ice margin at Fort Devens a few km to the north; however, context indicates probability of glacial transport and redeposition. [Plotted on histogram as advance date]

14 240 ± 240 (Y-950/51), basal sediment, Rogers Lake, CN (41°22'N, 72°18'W; Davis, 1969); corrected by 770 years for hardwater effect based on age of surface sediment; organic poor basal sediments may require a larger correction than highly organic surface sediment; Davis et al. (1980), nevertheless, prefer the uncorrected age of 15 010 ± 240.

15 110 ± 440 (SI-4320), basal organics, Upper South Branch Pond, ME (46°05'N, 68°54'W; Anderson et al., 1986); anomalously old; site probably deglaciated about 12 ka. Note that interstadial age wood was recovered from this site (see SI-4519 above).

14 800 ± 220 (GSC-1339), basal marly lake sediment, Unknown Pond, ME (45°36.5'N, 70°38'W; Mott, 1977); basal date considered anomalously early based on pollen stratigraphy compared to dates from nearby Boundary Pond, where basal date is 11.2 ka.

14 090 ± 450 (Pitt-743), shell from postglacial marine sediment, Saco Bay, ME (43°31.5'N, 70°19'W; Kelly et al., 1992).

16 500 ± 370 (GSC-1063), basal lake sediment, Little Lake, NB (45°14'35"N, 66°42'50"W; Mott, 1975); thought to be about 4000 years too old due to hard water effect.

15 820 ± 770 (no lab number given), sediment at marine-brackish transition in St. Patricks Lake, southwestern NB (Honig and Scott, 1987); date accepted by authors but probably hard water effect comparable to GSC-1063, same region.

13 900 ± 320 (Beta-12858; AMS), periostracum of Portlandia arctica from bottomset beds of proglacial delta, Spencers Island, NS (45°21.51'N, 64°42.53'W; Stea and Wightman, 1987); another sample of shell from these bottomsets dated 12 600 ± 270 (Beta-12859); published ages **14 300 ± 320** (Beta-12858) and 12 600 ± 320 (Beta-12859) not corrected for marine reservoir effect.

15 900 ± 1200 (GSC-2880), basal lake sediment, Leak Lake, NS (45°26.2'N, 64°21'W; Blake, 1986); considered anomalously old by several thousand years due to hard water effect.

14 100 ± 200 (GSC-1259), seaweed, Gilbert's Cove, NS (44°29.15'N, 65°57.0'W; Grant, 1971).

14 300 ± 150 (GSC-4448), organic silty clay (lake sediment), Church Point, NS (44°20.25'N, 66°06.15'W; McNeely and Jorgensen, 1993); judged to be too old on pollen stratigraphic grounds.

14 010 ± 90 (TO-2324), twigs in basal lake sediment, Chase Pond, Cape Breton Island, NS (45°39'05"N, 60°40'30"W; Mayle et al., 1993).

16 470 ± 140 (Beta-8993), shell fragment redeposited in Emerald Silt, thought to be reworked

postglacially(?), borehole 5, Banquereau, Scotian Shelf, NS (44°25'N, 58°22'W; Amos and Knoll, 1987); retreat minimum(?) published age 16 870 ± 140 not reservoir corrected.

17 050 ± 155 (Beta-27229), paired marine shells in Emerald Silt just above Scotian Shelf Drift, La Have Basin, NS (43°35'N, 63°35'W; Piper et al., 1990); shells about 2 m higher in core dated 16 320 ± 145 (Beta-27228; not reservoir corrected); published age 17 450 ± 155 not corrected for marine reservoir effect.

16 980 ± 300 (Beta-20738), marine shell from proglacial Emerald Silt above Scotian Shelf Drift in Emerald Basin, Scotian Shelf, NS (43°42'N, 62°48'W; Gipp and Piper, 1989); six other dates on Emerald Silt from nearby cores range from 13.74 to 16.69 ka (not reservoir corrected); published age 17 380 ± 300 not corrected for marine reservoir effect.

14 710 ± 140 (Beta-36446, ETH-6462), paired marine shells in upper Emerald Silt, Emerald Basin, Scotian Shelf, NS (43°55'N, 62°45'W; Piper and Fehr, 1991), a shell 90 cm higher in this core dated 14 870 ± 130 (Beta-36445, ETH-6461; not corrected for marine reservoir effect); published age 15 110 ± 140 not corrected for marine reservoir effect.

15 600 ± 120 (TO-1819), unidentified shell or foraminifera from base of Emerald Silt on the southern (distal) flank of the Fundian Moraine (part of the Scotian Shelf End Moraine system), Georges Basin, Scotian Shelf (ca 42.5°N, 67°W; Todd et al., 1999); Moraine age estimated at about 20 ka based on extrapolation of sedimentation rate. The authors note that Bacchus (1993) reported a date of 22.5 ka for formation of the Fundian Moraine on Sewell Ridge (ca 42.7°N, 67.5°W); note this moraine is at the LGM limit of Dyke and Prest (1987); published age 16 000 ± 120 not corrected for marine reservoir effect.

13 790 ± 100 (TO-2040), paired marine shells in postglacial mud at 71 m water depth off Lunenburg, NS (44°15'N, 64°10'W; Piper and Fehr, 1991); a sample 84 cm higher in the core dated 14 050 ± 100 (TO-2039); published ages 14 190 ± 100 not corrected for marine reservoir effect.

14 400 ± 530 (GSC-2573), single valve of marine shell (3 g), Mispec, NB (45°13.5'N, 65°57.2'W; Lowdon and Blake, 1979; Grant, 1989); anomalously old when compared to other shells from the region which date close to 13 ka; sample much smaller than normally used, hence large standard error.

14 050 ± 200 (UQ-1619), marine shells, Upper Charlo, NB (48°00'30"N, 66°29'W; Lamothe, 1992); date problematically early in light of dates from Laurentian Channel below.

14 140 ± 150 (UL-1573), marine shells, Cap-au-Renard, north coast of Gaspé Peninsula, QC (49°11'48"N, 66°13'22"W; Hétu and Gray, 2000); second determination from the same site 12 800 ± 130 BP (Beta-14404).

14 190 ± 200 (UL-1571), marine shells, Marsoui, north coast of Gaspé Peninsula, QC (49°12'45"N, 66°04'32"W; Hétu and Gray, 2000); considered to be anomalously old; accepted age of deglaciation ca 13.6 ka BP.

14 310 ± 150 (no lab no. given), foraminifera (?) from basal glaciomarine sediment, core V17-179, outer Laurentian Channel just above Lower Till of Josenhans and Lehman (1999); indicates late retreat from a site close to LGM ice limit.

14 020 ± 165 (AA-9120), foraminifera base of core HU90-028-037, central Laurentian Channel, Gulf of St Lawrence (Josenhans and Lehman, 1999); foraminifera 40 cm higher in core dated 14 085 ± 165 (AA-9435); site is about 300 km behind LGM ice limit.

14 040 ± 240 (TO-2547), foraminifera base of core HU90-031-019, inner Laurentian Channel south of Anticosti Island, Gulf of St Lawrence (49°17.44'N, 63°59.57'W; Rodrigues et al., 1993); indistinguishable from AA-9120, 300 km farther down channel.

14 100 ± 130 (GSC-4229), marine shells in diamicton related to Robinsons Head Readvance, Stormy Point, NF (47°50.4'N, 59°22.4'W; Blake, 1988).

19 000 ± 330 (no lab no. cited), marine shells in surficial sediment, Grand Banks, NF (44°45'N, 52°45'W; Muller and Milliman, 1973); site presumably not glaciated since that time; another sample dated 17 100 ± 270 BP (no lab no. cited).

14 170 ± 90 (Beta-88458), marine shell from glaciomarine sediment in front of end moraine at mouth of Grey River Fiord, south coast NF (ca 47.5°N, 57°W; Shaw et al., in press); only date from south coast of island exceeding 14 ka; possibly slightly too old because shell from lower in same core dated 13 730 ± 140 (TO-3182).

21 800 ± 500 (Beta-12229), foraminifera from core 78-023-020, Notre Dame Channel, off northeast NF (ca 50°N, 54.5°W; Scott et al., 1989); probably not reservoir corrected. Dated interval overlies till. At face value, date indicates that, if Late Wisconsinan ice extended beyond the core site, it had retreated by this time.

20 520 ± 400 (SI-3352), basal sediment, Alexis Lake, Labrador (52°31'N, 57°02'W); initially thought to indicate that Paradise Moraine represented the LGM limit in southeast Labrador (e.g. Fulton and Hodgson, 1979); now considered anomalously early.

15 300 ± 450 (GSC-1807), basal organic lake sediment, Lac Saint-Ignace, Gaspé, QC (49°01.5'N, 66°22.25'W; Lowdon and Blake, 1979); anomalously early date probably due to hard water effect; site thought to have ben deglaciated about 10 ka (Richard et al, 1997).

15 000 ± 110 (TO-1428), moss in basal lake sediment, Lac J'Arrive, Gaspé, QC (49°14'50"N, 65°22'35"W); anomalous early date for site deglaciated about 12 ka (Richard et al., 1997).

14 500 ± 300 [or ± 800] (UQ-551), marine shells from ice proximal glaciomarine sediment, Anticosti Island, QC (49°24'N, 63°34.63'W; Gratton et al., 1984); note that the standard error is given as 800 years elsewhere in this paper; three other dates on same stratigraphic unit span 13 200 ± 200 (UQ-505) to 13 570 ± 200 (UQ-502); UQ dates are not corrected for carbon fractionation or reservoir age.

14 170 ± 150 (UL-1193), marine shells, St-Fabien, QC (48°18'25"N, 68°51'12"W; Hétu, 1998);

anomalously early age for regional deglaciation; shells from the site redated at 13 240 ± 80 (TO-4637).

6. Central Laurentide region, Labrador-Quebec

16 800 ± 2300 (GX-6387), basal silty clay, Palsa Lake, QC (58°28'N, 65°10'W; Short, 1981); anomalously early date for region probably deglaciated after 9 ka; Manley and Jennings (1996) report that the organic content of the dated sample was <0.5%; a subsequent assessment on the <125 micrometre fraction yielded a result of 16 380 ± 165 (AA-9288), whereas the >125 micrometre fraction yielded a result of 7575 ± 125 (AA-9289 & AA-9497); only the first result is plotted on the histogram.

16 330 ± 330 (QL-1214), basal mud, Boundary Lake, QC (55°15'N, 67°24'W; Short, 1981); anomalously early date for region probably deglaciated after 7 ka.

14 040 ± 780 (GX-6366), basal clay, Tunturi Lake, QC (55°01'N, 67°30'W; Short, 1981); anomalously early date for region probably deglaciated after 7 ka.

7. Northeastern Laurentide margin

18 210 ± 1900 (GX-6362), basal silty clay, Square Lake, Labrador (58°38'N, 63°36'W; Short, 1981); organic content <0.1%; lake dammed by Saglek Moraine; redated close to 8 ka (Clark et al., 1989).

14 115 ± 110 (AA-7010), humic acid fraction of bulk lake sediment, Water Lake, Baffin Island, NU (63°19'N, 64°10'W; Manley and Jennings, 1996); similar material from lower in core dated 13 195 ± 125 (AA-7011).

16 849 ± 860 (GX-9030), peat, Arctic Bay, Baffin Island, NU (73.05°N, 85.03°W; Andrews et al., 1989); date now considered anomalously old; material lower in core dated 14 185 ± 760 (GX-9304) and 15 810 ± 490 (GX-10628).

14 965 ± 250 (AA-7138), foraminifera at 400 cm depth in core HU82-034-057 at 933 m water depth, Resolution Basin, southeast Baffin Shelf (61°46.8'N, 63°49.7'W; Andrews et al., 1994). Site may be beyond LGM limit and core has a basal date of 24 ka (Praeg et al., 1986). However, AA-7138 is the oldest for the glacial-interglacial transition on the SE Baffin Shelf. A sedimentary hiatus at 320 cm in this core has foraminifera dates below and above of 14 055 ± 110 (AA-5992) and 13 225 ± 150 (AA-5063; both with 400 year corrections). The hiatus may represent a re-advance of the Hudson Strait Ice Stream across the site during Heinrich-1 event (Andrews et al., 1994).

8. Innuitian Ice Sheet

14 600 ± 340 (GSC-5511), marine shell fragments from surface below marine limit, Brock Island, NT (Hodgson et al., 1994); probably a blended age using Holocene and much older shells; old shells occur in the vicinity.

14 540 ± 300 (MGU-334), marine shells, Stewart Point, Devon Island, NU (76°23'N, 95°37'W; Glushankova et al., 1980; Dyke, 1999); located above postglacial marine limit and thought to represent contaminated (carbonate incrusted) pre-Late Wisconsinan shells that have been glacially transported.

16 000 ± 240 (Y-1297), marine shells from surface of raised beach, Truelove Lowland, Devon Island, NU (Barr, 1971; Dyke, 1999); sample probably included Holocene and much older shells; older shells dated from nearby site.

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